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On-Orbit Free Molecular Flow Aerodynamic Characteristics of a Proposed Space Operations Center Configuration

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NOMENCLATURE

a, b, c, d, e	First, second, third, fourth, and fifth coefficients for the equation of a conic.
A_{REF}	Reference area
C_A	Axial force coefficient
C_D	Drag force coefficient
C_ℓ	Rolling moment coefficient
C_m	Pitching moment coefficient
C_N	Normal force coefficient
C_n	Yawing moment coefficient
C_Y	Side force coefficient
dA	Elemental area size
dC/dA	Force coefficient component on an elemental area
erf	Error function
k, ℓ, t	Direction cosines between the X_f, Y_f, and Z_f axes, respectively, of the individual coordinate system and the desired force direction
L_{REF}	Moment reference length
R	Gas constant for a particular gas
r	Magnitude of radius measured from the centerline of a conic shape to the elemental area centroid
S	Molecular speed ratio, $= V_\infty/\sqrt{2RT_f}$
T_f	Temperature of the incident molecules
T_w	Temperature of the body surface
V_∞	Free-stream air speed of the vehicle relative to the surrounding atmosphere
X_b	X_f-location of the base of a conic section

X, Y, Z	Space operations center reference axes system
X_f, Y_f, Z_f	Individual subshape coordinate system
X_n	X_f-location of the nose of a conic section
X_p, Y_p, Z_p	Computer program composite reference axes system
α	Angle of attack, angle between the velocity vector and the X axis
$\varepsilon, \gamma, \eta$	Direction cosines between the local X_f, Y_f, and Z_f axes, respectively, and the mass velocity vector
σ_n	Normal momentum accommodation coefficient
σ_t	Tangential momentum accommodation coefficient
ϕ	Angle of roll, angle between the plane formed by the velocity vector and the X-axis and the plane formed by the X and Y axes

I. INTRODUCTION

With the upcoming operational status of the Space Shuttle as a viable Space Transportation System, the next logical step in the evolution of United States Manned Space Flight capability is the establishment of a space operations capability. In pursuit of such a possible goal, a conceptual analysis of a Space Operations Center (SOC) has been completed. In support of a study contract (reference 1), the on-orbit aerodynamic characteristics based on free molecular flow theory have been calculated for a proposed SOC configuration shown in figure 1. That configuration consists of eight stages of buildup. The calculated free molecular flow aerodynamic characteristics are presented for each stage of the buildup process through the anticipated operating range of angles of attack from 0° to 360° and roll angles from -60° to +60°. The reference altitude is 490 kilometers, however, the data should be applicable to altitudes down to 185 kilometers.

Calculation of the aerodynamic characteristics was accomplished through the use of an orbital aerodynamics computer program. The computation method is described with respect to the program input requirements and the free molecular theory used.

Each component of the SOC configuration used in the buildup process is described. Details include the use of the component, its size and shape, and its position with respect to other components for each of the eight stages of configuration buildup.

II. COMPUTATION METHOD

The analysis presented herein was accomplished through the use of the orbital aerodynamics computer program described and listed in reference 2.

To input into the reference computer program, complex vehicles must be broken down into many composite parts or subshapes which are defined as cones and cone frustums, cylinders, spheres, or flat platesthat are circular, rectangular, or right triangular in shape. Each composite part is treated as a separate body, and the computer program includes a shadowing logic, which checks for shadowing resulting from an elemental area being located on the back side (away from the flow) of the subshape or from another subshape lying between the elemental area and the velocity flow vector. Classical free molecular flow theory is utilized in the program to calculate the free molecular flow force and moment coefficients for orbital vehicle.

The free molecular flow regime involves the regime of extreme rarefaction where the molecular mean free path is many times that of the characteristic dimension of the body, which is assumed to be immersed in a gas flow of infinite extent. A basic assumption of free molecular flow theory involves molecules which impact the body surfaces and are reemitted and travel large distances before colliding with other molecules. As a result, one can neglect, as far as effects on the body itself, the effect of the reemitted particles on the incident stream. Therefore, the incident flow is totally undisturbed by the presence of the body. No shock waves are expected to form in the vicinity of the body and any

boundary layer will be very diffuse and have no effect on the flow which is incident on the body.

To calculate flux of momentum or energy incident on the body surface, it is assumed that the approaching gas is in local Maxwellian equilibrium. The tangential and normal momentum accommodation coefficients characterize the transfer of energy and momentum during the particle-body collisions, and for the fully accommodated diffuse particle reflection utilized in this report, the accommodation coefficients are assumed to be unity. It is further assumed that the body is at a uniform temperature equal to 0.253 incident molecule temperature. The general equation for the total force component in a particular direction of an elemental area based upon the physical assumptions of kinetic energy and free molecular flow is then:

$$\frac{dC}{dA} = \frac{1}{A_{REF}}\left\{\left[\sigma_T(\epsilon k + nt) + (2 - \sigma_n)\gamma\ell\right]\left[\gamma(1 + \text{erf}\,\gamma S) + \frac{1}{S\sqrt{\pi}}\,e^{-\gamma^2 S^2}\right] + \frac{(2 - \sigma_n)}{2S^2}\,\ell(1 + \text{erf}\,\gamma S) + \frac{\sigma_n\,\ell}{2}\sqrt{\frac{T_w}{T_f}}\left[\frac{\gamma\sqrt{\pi}}{S}(1 + \text{erf}\,\gamma S) + \frac{1}{S^2}\,e^{-\gamma^2 S^2}\right]\right\}$$

where

$A_{REF} = 249.91\ m^2$

$T_w/T_f = 0.253$

$S = 4.8$

$\sigma_t = 1.0$

$\sigma_n = 1.0$

k, ℓ, t = direction cosines between the subsurface X, Y, and Z axes and the desired force direction

ε, γ, η = direction cosines between subsurface X, Y, and Z axes and mass velocity vector

erf γS = the error function of γS

From the $\frac{dC}{dA}$ relationship, the normal and axial force coefficients for each body in each of the component directions is found by integrating over the surface of the body. Resultant drag forces are then computed by $C_D = C_A \cos \alpha + C_N \sin \alpha \cos \phi - C_\ell \sin \alpha \sin \phi$.

The reference computer program obtains the moment coefficients after the force coefficient components have been determined. The method consists of determining the moment contribution of each elemental area about the origin of the composite axis system utilized for surface input to the program. That moment contribution is the product of the force coefficient components and the distance of that element from the origin divided by the reference length. The reference length is defined as twice the input reference radius, from which the reference area is determined. The aerodynamic body axis system utilized in the program is illustrated in figure 2.

Input of the SOC configuration into the computer program was accomplished through the use of 119 subsurfaces. An example of the typical subsurface input required to define a vehicle component is illustrated in figure 3 for a habitation module. Figure 4 illustrates the input required to define the various types of allowable subsurfaces.

III. CONFIGURATION DESCRIPTION

The proposed reference configuration for a Space Operations Center is shown in figure 1 and consists of eight stages of buildup. Each stage is to be carried into orbit by the Space Shuttle Orbiter depicted in figure 1; however, the orbiter does not constitute a part of the reference configuration. The configuration modules are launched and assembled as stages of buildup in the order as described below.

Service Module 1 - The service module provides electrical power, guidance, attitude control, navigation, communications, and an airlock and pressurized passageway to interconnect all modules of the total configuration. Four peripheral berthing ports and two end docking ports are provided, as illustrated in figure 5. A large solar array is mounted on a boom to one side of the module. The boom is configured to not rotate in pitch and contains a two-axis gimbal at the outboard end to provide for pointing the solar array toward the sun. Also mounted on the boom are radiator panels, omni-directional antennas, a steerable dish antenna, and reaction control thrusters.

Service Module 2 - A second service module, identical to the first service module, is docked to service module 1 to form a basically symmetrical configuration as shown in figure 1. The docked service modules comprise stage two of the buildup process.

Habitation Module 1 - The habitation module consists of a cylinder with a conical frustum on each end. As illustrated in figure 6, the module is 11.735 meters long and 4.267 meters in diameter. This habitation module is attached to the top berthing port of service module 1 and

provides living accommodations and health maintenance facilities. Such assembly comprises stage three of the buildup.

Habitation Module 2 - Stage four of the buildup process consists of attachment of a second habitation module to the top berthing port of service module 2. That habitation module is identical in external geometry to habitation module 1.

Logistics Module and Transfer Tunnel - The logistics module of figure 7 and the transfer tunnel of figure 8 are launched together and constitute stage five of the buildup process. The logistics module is attached to the side berthing port of service module 1 on the solar array side. The transfer tunnel is attached as an interconnect between the tops of the two habitation modules. A docking port is included at each end of the tunnel as backups to the primary docking ports at each end of the service module combination.

RMS/Control Module and Stage Assembly System - The RMS/control module is mounted, as shown in figure 1, on the +Y side berthing port of service module 2. That position provides improved visibility of construction operations and improved reach to the far side of the construction module and stage assembly system. Its external geometry is shown in figure 9. Also shown in figure 1 is the stage assembly system, which is located on the berthing port directly beneath the habitation module 1 on service module 1. The system is comprised of the structure attached to the berthing post and the planetary probe stages illustrated in figure 10. The open truss structure was not simulated in this study. This assembly operation results in stage six of the buildup process.

Construction Module - Stage seven of the buildup process consists of attachment of the construction module illustrated in figure 11. The module consists of a handling fixture and a beam builder attached to the docking port at the end of service module 2. Here again, the open truss structure depicted in figure 11 was not simulated in this study.

OTV - Installation of the orbital transfer vehicle (OTV) to the SOC is the eighth and final stage of the configuration buildup process. The OTV, illustrated in figure 12, is located on the berthing port directly beneath the habitation module 2 on service module 2.

For the purpose of this analysis, the SOC components are positioned as represented in figure 1. Each component was defined in the previously described computer program by cones and cone frustums, cylinder, spheres, and flat plates of circular, rectangular, and right-triangular shapes.

IV. RESULTS

In the planned operational mode, the SOC will be stabilized to rotate in pitch about the Y, or booms, axis. For that reason, the aerodynamic characteristics are calculated at angles of attack from 0° to 360° and at roll angles of -60° to 60°. Since the first stage of buildup is the service module 1 and results in an unsymmetrical configuration, the aerodynamic characteristics for that stage are calculated for roll angles of 0° to 360°.

The resultant aerodynamic characteristics are presented in tables I through VIII and represent each of the eight stages of configuration buildup, as previously described. Table IX shows the aerodynamic charac-

teristics of the solar panels alone. These data are required to correct the data of tables I through VIII for the requirement that the solar panels do not rotate in pitch with the basic SOC configuration and remain oriented toward the sun. The moment reference center is defined as X, Y, Z = 0, 0, 0 and corresponds to the docking interface on service module 1, as illustrated in figure 1.

Since drag is of primary importance in determining orbital decay, figure 13 presents plots of the drag coefficient as a function of angle of attack with roll angle at 0°. The plot represents the total SOC configuration, buildup stage eight, as shown in figure 1.

V. REFERENCES

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2. Warr, John W., III, "An Orbital Aerodynamics Computer Program to Calculate Force and Moment Coefficients on Complex Vehicle Configurations," Lockheed Missiles & Space Company, Huntsville Research & Engineering Center, TM54/20-275, LMSC/HREC D162498, Contract NAS8-20082, August 1970.

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 400 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	1.1438	0.3323	0.0001	1.1841	-0.0831	-2.0640	0.7096
20.0	1.6485	0.7912	-0.0001	1.8191	-0.3009	-3.4220	1.7541
30.0	2.0868	1.4198	-0.0004	2.4780	-0.6281	-4.4658	3.2272
40.0	2.1924	2.1291	-0.0001	3.0479	-1.0971	-4.9959	4.9656
50.0	2.1239	2.8590	-0.0003	3.5553	-1.5426	-4.8442	6.7735
60.0	1.8388	3.5272	-0.0004	3.9696	-1.9284	-4.3155	8.4398
70.0	1.3333	4.0818	-0.0001	4.2536	-2.2081	-3.1848	9.7273
80.0	0.7027	4.3698	0.0000	4.4254	-2.5453	-1.6690	10.6420
90.0	-0.0007	4.5132	0.0000	4.5142	-2.6741	0.0008	10.9496
100.0	-0.7031	4.3710	-0.0003	4.4266	-2.6355	1.6903	10.6428
110.0	-1.3271	4.0340	0.0001	4.2458	-2.4215	3.1785	9.7662
120.0	-1.8232	3.5226	0.0002	3.9622	-2.1983	4.3066	8.4289
130.0	-2.1297	2.8721	0.0000	3.5690	-1.8339	4.9402	6.7696
140.0	-2.1962	2.1367	0.0000	3.0558	-1.4115	4.9965	4.9672
150.0	-2.0301	1.4198	-0.0003	2.4880	-0.9843	4.4658	3.2283
160.0	-1.6556	0.7971	-0.0002	1.8283	-0.6005	3.4227	1.7549
170.0	-1.1352	0.3324	-0.0001	1.1756	-0.3029	2.0658	0.7101
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1431	-0.3319	-0.0005	1.1856	-0.3274	2.0650	-0.7100
200.0	-1.6522	-0.7918	-0.0004	1.8233	-0.5165	3.4227	-1.7549
210.0	-2.0500	-1.4156	-0.0004	2.4667	-0.8685	4.4656	-3.2282
220.0	-2.1890	-2.1245	-0.0003	3.0425	-1.0866	4.9965	-4.9673
230.0	-2.1296	-2.8648	-0.0003	3.5635	-1.5352	4.9847	-6.7744
240.0	-1.8316	-3.5268	-0.0003	3.9718	-1.9555	4.3159	-8.4421
250.0	-1.3381	-4.0553	-0.0001	4.2684	-2.3052	3.1856	-9.7814
260.0	-0.7050	-4.3751	-0.0001	4.4310	-2.5452	1.6903	-10.6430
270.0	-0.0008	-4.5123	0.0000	4.5123	-2.6714	0.0008	-10.9496
280.0	0.7034	-4.3718	-0.0001	4.4275	-2.6385	-1.6690	-10.6421
290.0	1.3271	-4.0219	-0.0001	4.2332	-2.4754	-3.1805	-9.7654
300.0	1.8166	-3.4997	0.0000	3.9341	-2.2015	-4.3065	-8.4276
310.0	2.1229	-2.8541	-0.0002	3.5509	-1.8395	-4.9395	-6.7664
320.0	2.1881	-2.1228	-0.0001	3.0407	-1.4178	-4.9958	-4.9655
330.0	2.0262	-1.4100	-0.0002	2.4593	-0.9930	-4.4657	-3.2277
340.0	1.6453	-0.7889	0.0000	1.8159	-0.6054	-3.4224	-1.7543
350.0	1.1348	-0.3504	0.0003	1.1768	-0.3056	-2.0655	-0.7097
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	1.1369	0.3221	-0.0354	1.1785	-0.0797	-2.0229	0.6945
20.0	1.6386	0.7771	-0.1037	1.8076	-0.5165	-3.3153	1.7052
30.0	2.0097	1.3851	-0.2014	2.4400	-0.6598	-4.2858	3.1298
40.0	2.1078	2.0767	-0.3158	3.0104	-1.0663	-4.7368	4.8111
50.0	2.1068	2.7975	-0.4354	3.5224	-1.5026	-4.6165	6.5580
60.0	1.8132	3.4469	-0.5437	3.9281	-1.9112	-3.9329	8.1705
70.0	1.3191	3.9453	-0.6289	4.2047	-2.2437	-2.7678	9.4652
80.0	0.6955	4.2684	-0.6831	4.3772	-2.4802	-1.2614	10.3034
90.0	-0.0006	4.3745	-0.6989	4.4295	-2.5887	0.4129	10.5920
100.0	-0.6970	4.2762	-0.6839	4.3871	-2.5703	2.0669	10.3021
110.0	-1.3128	3.9801	-0.6265	4.1974	-2.4067	3.4967	9.4508
120.0	-1.7998	3.4315	-0.5402	3.9077	-2.1385	4.5568	8.1564
130.0	-2.1015	2.7959	-0.4345	3.5177	-1.7863	5.1209	6.5552
140.0	-2.1703	2.0836	-0.3155	3.0168	-1.3782	5.1077	4.8129
150.0	-2.0022	1.3833	-0.2002	2.4328	-0.9620	4.5178	3.1313
160.0	-1.6340	0.7762	-0.1035	1.8058	-0.5892	3.4350	1.7063
170.0	-1.1255	0.3266	-0.0347	1.1653	-0.2991	2.0632	0.6948
180.0	-0.9229	-0.0009	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1345	-0.3258	0.0349	1.1780	0.0788	2.0282	-0.6945
200.0	-1.6346	-0.7743	0.1056	1.8029	0.3092	3.3162	-1.7057
210.0	-2.0042	-1.3863	0.2009	2.4360	0.6489	4.2647	-3.1301
220.0	-2.1735	-2.0819	0.3160	3.0181	1.0594	4.7389	-4.8110
230.0	-2.1024	-2.7911	0.4334	3.5146	1.4935	4.6171	-6.5577
240.0	-1.8046	-3.4300	0.5406	3.9098	1.9004	3.9536	-8.1696
250.0	-1.3193	-3.9451	0.6275	4.2084	2.2816	2.7662	-9.4649
260.0	-0.6957	-4.2624	0.6804	4.3710	2.4772	1.2627	-10.2986
270.0	-0.0004	-4.3768	0.6988	4.4336	2.5903	-0.4115	-10.5870
280.0	0.6953	-4.2646	0.6810	4.3731	2.5721	-2.0656	-10.3003
290.0	1.3094	-3.9155	0.6250	4.1729	2.4080	-3.4989	-9.4473
300.0	1.7970	-3.4146	0.5383	3.8916	2.1445	-4.5589	-8.1528
310.0	2.0930	-2.7760	0.4316	3.4975	1.7961	-5.1178	-6.5484
320.0	2.1627	-2.0704	0.3139	3.0023	1.3855	-5.1065	-4.8098
330.0	1.9950	-1.3734	0.2002	2.4213	0.9640	-4.5186	-3.1296
340.0	1.6223	-0.7693	0.1051	1.7897	0.5916	-3.4354	-1.7055
350.0	1.1264	-0.3237	0.0352	1.1657	0.3013	-2.0638	-0.6943
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000
10.0	1.1072	0.3096	-0.0673	1.1449	-0.0710	-1.9397	0.6550
20.0	1.5825	0.7259	-0.1961	1.7433	-0.2908	-3.1234	1.5809
30.0	1.9795	1.2874	-0.3810	2.3498	-0.6043	-3.9899	2.8790
40.0	2.0869	1.9220	-0.5967	2.8907	-0.9784	-4.3585	4.4089
50.0	2.0261	2.5828	-0.8240	3.3778	-1.3706	-4.1740	5.9983
60.0	1.7456	3.1839	-1.0310	3.7691	-1.7566	-3.4591	7.4656
70.0	1.2728	3.6498	-1.1918	4.0412	-2.0668	-2.2986	8.6433
80.0	0.6697	3.9400	-1.2922	4.1976	-2.2832	-0.8293	9.4046
90.0	-0.0005	4.0132	-1.3140	4.2208	-2.3718	0.7753	9.6601
100.0	-0.6706	3.9437	-1.2929	4.2016	-2.3680	2.3498	9.4035
110.0	-1.2421	3.6349	-1.1859	4.0228	-2.2184	3.6810	8.6257
120.0	-1.7317	3.1684	-1.0251	3.7479	-1.9758	4.6503	7.4519
130.0	-2.0193	2.5806	-0.8221	3.3710	-1.6523	5.1268	5.9918
140.0	-2.0896	1.9284	-0.5980	2.8970	-1.2799	5.0550	4.4105
150.0	-1.9306	1.2847	-0.3796	2.3404	-0.8989	4.4315	2.8802
160.0	-1.5804	0.7272	-0.1963	1.7418	-0.5565	3.3492	1.5816
170.0	-1.1013	0.3105	-0.0667	1.1392	-0.2883	2.0159	0.6563
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1069	-0.3088	0.0661	1.1443	0.0668	1.9486	-0.6559
200.0	-1.5775	-0.7226	0.1953	1.7375	0.2828	3.1239	-1.5805
210.0	-1.9332	-1.2823	0.3604	2.3417	0.5947	3.9901	-2.8770
220.0	-2.0903	-1.9243	0.5973	2.8948	0.9711	4.3582	-4.4073
230.0	-2.0187	-2.5732	0.8191	3.3648	1.3698	4.1748	-5.9962
240.0	-1.7301	-3.1557	1.0203	3.7353	1.7435	3.4611	-7.4621
250.0	-1.2661	-3.6304	1.1840	4.0193	2.0584	2.3003	-8.6395
260.0	-0.6676	-3.9202	1.2836	4.1760	2.2760	0.8321	-9.3967
270.0	-0.0003	-4.0118	1.3139	4.2192	2.3732	-0.7743	-9.6534
280.0	0.6656	-3.9140	1.2820	4.1694	2.3632	-2.3459	-9.3987
290.0	1.2543	-3.5976	1.1731	3.9827	2.2153	-3.6804	-8.6167
300.0	1.7227	-3.1419	1.0162	3.7192	1.9777	-4.6494	-7.4443
310.0	2.0085	-2.5583	0.8145	3.3460	1.6555	-5.1263	-5.9870
320.0	2.0816	-1.9155	0.5939	2.8822	1.2854	-5.0538	-4.4069
330.0	1.9282	-1.2758	0.3784	2.3303	0.9050	-4.4311	-2.8777
340.0	1.5668	-0.7188	0.1942	1.7260	0.5581	-3.3488	-1.5806
350.0	1.1015	-0.3075	0.0665	1.1389	0.2900	-2.0151	-0.6558
360.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	1.0634	-0.2835	-0.0940	1.0980	-0.0595	-1.6198	-0.5979
20.0	1.4930	0.6465	-0.2704	1.6407	-0.2283	-2.8552	1.3930
30.0	1.8152	1.1294	-0.5225	2.1916	-0.5183	-3.5978	2.5087
40.0	1.9594	1.6852	-0.8195	2.7024	-0.6832	-5.8783	3.8042
50.0	1.8973	2.2541	-1.1285	3.1471	-1.1896	-5.6463	5.1560
60.0	1.6359	2.7760	-1.4125	3.5115	-1.5180	-2.9303	6.4029
70.0	1.1928	3.1765	-1.6308	3.7591	-1.7873	-1.8164	7.4032
80.0	0.6249	3.4215	-1.7649	3.8956	-1.9747	-0.4523	8.0485
90.0	-0.0006	3.4619	-1.7817	3.8889	-2.0428	1.0481	8.2580
100.0	-0.6269	3.4322	-1.7705	3.9078	-2.0564	2.5027	8.0476
110.0	-1.1840	3.1667	-1.6259	3.7475	-1.9320	3.7051	7.3875
120.0	-1.6278	2.7710	-1.4093	3.5024	-1.7262	4.5609	6.3908
130.0	-1.8921	2.2533	-1.1274	3.1429	-1.4465	4.9444	5.1540
140.0	-1.9613	1.6905	-0.8213	2.7074	-1.1307	4.8307	3.8057
150.0	-1.8159	1.1329	-0.5225	2.1938	-0.8018	4.2022	2.5022
160.0	-1.4992	0.6500	-0.2723	1.6479	-0.5054	3.1659	1.3935
170.0	-1.0677	0.2858	-0.0943	1.1027	-0.2721	1.9263	0.5982
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0646	-0.2826	0.0930	1.0990	0.0548	1.8207	-0.5978
200.0	-1.4914	-0.6443	0.2702	1.6385	0.2421	2.8554	-1.3924
210.0	-1.8178	-1.1342	0.5226	2.1944	0.5114	3.5983	-2.4995
220.0	-1.9619	-1.6867	0.8204	2.7055	0.8369	3.8776	-3.8017
230.0	-1.8884	-2.2433	1.1203	3.1311	1.1805	3.6478	-5.1519
240.0	-1.6201	-2.7504	1.3954	3.4773	1.5066	2.9332	-6.3976
250.0	-1.1820	-3.1499	1.6139	3.7260	1.7758	1.8209	-7.3973
260.0	-0.6212	-3.3973	1.7491	3.8605	1.9654	0.4575	-8.0391
270.0	-0.0004	-3.4585	1.7807	3.8855	2.0428	-1.0469	-8.2564
280.0	0.6188	-3.3884	1.7446	3.8563	2.0466	-2.4944	-8.0409
290.0	1.1690	-3.1167	1.5965	3.6862	1.9228	-3.6985	-7.3764
300.0	1.6057	-2.7256	1.3838	3.4062	1.7223	-4.5539	-6.3810
310.0	1.8775	-2.2284	1.1132	3.1115	1.4506	-4.9497	-5.1463
320.0	1.9423	-1.6694	0.8103	2.6776	1.1328	-4.8272	-3.8014
330.0	1.8050	-1.1221	0.5187	2.1787	0.8065	-4.2012	-2.4993
340.0	1.4873	-0.6425	0.2694	1.6359	0.5076	-3.1644	-1.3924
350.0	1.0590	-0.2819	0.0935	1.0934	0.2726	-1.9253	-0.5977
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

e) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	1.0143	0.2511	-0.1149	1.0451	-0.0680	-1.6702	0.5253
20.0	1.3812	0.5488	-0.2516	1.5184	-0.1977	-2.5238	1.1620
30.0	1.6524	0.9301	-0.4263	1.9461	-0.4144	-3.1281	2.0300
40.0	1.7760	1.3823	-0.9540	2.4353	-0.6754	-3.3226	3.0642
50.0	1.7156	1.8373	-1.3098	2.8256	-0.9541	-3.0649	4.1268
60.0	1.4767	2.2540	-1.6368	3.1448	-1.2177	-2.3825	5.1642
70.0	1.0751	2.6717	-1.8861	3.3945	-1.4286	-1.3593	5.8862
80.0	0.5632	2.7684	-2.0416	3.4786	-1.5871	-0.1101	6.3925
90.0	-0.0005	2.7913	-2.0564	3.4800	-1.6387	1.2018	6.5508
100.0	-0.5650	2.7772	-2.0499	3.4708	-1.6601	2.4924	6.3902
110.0	-1.0685	2.5667	-1.8834	3.3508	-1.5453	3.5378	5.8727
120.0	-1.4731	2.2539	-1.6382	3.1438	-1.4114	4.2694	5.0944
130.0	-1.7291	1.8531	-1.3228	2.8502	-1.1988	4.5877	4.1275
140.0	-1.7907	1.3953	-0.9647	2.4573	-0.9430	4.4301	3.0652
150.0	-1.6623	0.9431	-0.6151	1.9985	-0.6791	3.8322	2.0389
160.0	-1.3908	0.5529	-0.3247	1.5232	-0.4409	2.8911	1.1627
170.0	-1.0155	0.2520	-0.1155	1.0465	-0.2502	1.7996	0.5256
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0166	-0.2503	0.1146	1.0473	0.0390	1.6709	-0.5250
200.0	-1.3778	-0.5462	0.3205	1.5083	0.1915	2.5243	-1.1611
210.0	-1.6604	-0.9394	0.6139	1.9951	0.4078	3.1277	-2.0359
220.0	-1.7860	-1.3888	0.9602	2.4487	0.6698	3.3211	-3.0608
230.0	-1.7123	-1.8330	1.3048	2.8187	0.9469	3.0648	-4.1218
240.0	-1.4627	-2.2341	1.6176	3.1139	1.2075	2.3860	-5.0972
250.0	-1.0651	-2.5483	1.8658	3.3256	1.4231	1.3653	-5.8789
260.0	-0.5591	-2.7435	2.0191	3.4448	1.5763	0.1185	-6.3815
270.0	-0.0004	-2.7878	2.0529	3.4552	1.6390	-1.2004	-6.5418
280.0	0.5584	-2.7442	2.0209	3.4464	1.6535	-2.4839	-6.3818
290.0	1.0573	-2.5309	1.8534	3.3031	1.5607	-3.5309	-5.8620
300.0	1.4567	-2.2251	1.6122	3.1006	1.4084	-4.2651	-5.0863
310.0	1.7117	-1.8301	1.3036	2.8161	1.1985	-4.5799	-4.1194
320.0	1.7723	-1.3779	0.9505	2.4288	0.9439	-4.4246	-3.0605
330.0	1.6550	-0.9362	0.6103	1.9880	0.6835	-3.8302	-2.0358
340.0	1.3810	-0.5471	0.3212	1.5116	0.4436	-2.8898	-1.1611
350.0	1.0088	-0.2496	0.1141	1.0394	0.2504	-1.7981	-0.5250
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = 50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000
10.0	0.9441	0.2135	-0.1273	0.9704	-0.0262	-1.4964	0.4439
20.0	1.2359	0.4383	-0.3428	1.3475	-0.1420	-2.1468	0.9109
30.0	1.4707	0.7301	-0.6477	1.7564	-0.3032	-2.5966	1.5396
40.0	1.5637	1.0601	-1.0006	2.1285	-0.4965	-2.7126	2.2718
50.0	1.4930	1.3870	-1.3562	2.4385	-0.7021	-2.4447	3.0255
60.0	1.2818	1.6893	-1.6911	2.7031	-0.8956	-1.8388	3.7190
70.0	0.9311	1.9185	-1.9455	2.8777	-1.0534	-0.9508	4.2699
80.0	0.4858	2.0561	-2.0974	2.9681	-1.1656	0.1161	4.6271
90.0	-0.0006	2.0751	-2.1203	2.9581	-1.2067	1.2235	4.7312
100.0	-0.4839	2.0565	-2.0994	2.9696	-1.2243	2.2996	4.6173
110.0	-0.9296	1.9201	-1.9501	2.8814	-1.1718	3.1818	4.2614
120.0	-1.2855	1.6952	-1.7007	2.7147	-1.0671	3.7822	3.7141
130.0	-1.5158	1.4054	-1.3810	2.4768	-0.9183	4.0223	3.0260
140.0	-1.5740	1.0671	-1.0095	2.1437	-0.7352	3.8613	2.2721
150.0	-1.4798	0.7353	-0.6538	1.7683	-0.5443	3.3359	1.5400
160.0	-1.2584	0.4440	-0.3504	1.3719	-0.3668	2.5382	0.9114
170.0	-0.9530	0.2138	-0.1269	0.9796	-0.2243	1.6437	0.4441
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.9501	-0.2120	0.1269	0.9762	-0.0213	1.5006	-0.4437
200.0	-1.2408	-0.4371	0.3433	1.3520	0.1363	2.1476	-0.9099
210.0	-1.4764	-0.7315	0.6510	1.7650	0.2971	2.5965	-1.5373
220.0	-1.5689	-1.0617	1.0040	2.1349	0.4699	2.7117	-2.2676
230.0	-1.4884	-1.3800	1.3492	2.4280	0.6934	2.4522	-3.0198
240.0	-1.2652	-1.6672	1.6650	2.6652	0.8837	1.8456	-3.7113
250.0	-0.9198	-1.8951	1.9178	2.8397	1.0428	0.9582	-4.2624
260.0	-0.4812	-2.0327	2.0686	2.9308	1.1568	-0.1071	-4.6164
270.0	-0.0005	-2.0601	2.0976	2.9310	1.2059	-1.2172	-4.7237
280.0	0.4803	-2.0330	2.0688	2.9310	1.2234	-2.2977	-4.6135
290.0	0.9193	-1.8932	1.9169	2.8377	1.1694	-3.1751	-4.2511
300.0	1.2717	-1.6732	1.6745	2.6781	1.0673	-3.7774	-3.7065
310.0	1.4906	-1.3799	1.3513	2.4305	0.9170	-4.0143	-3.0203
320.0	1.5603	-1.0551	0.9968	2.1220	0.7364	-3.8562	-2.2681
330.0	1.4778	-0.7315	0.6510	1.7642	0.5483	-3.3352	-1.5374
340.0	1.2514	-0.4402	0.3468	1.3655	0.3711	-2.5369	-0.9101
350.0	0.9559	-0.2132	0.1293	0.9824	0.2252	-1.6431	-0.4437
360.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.83 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000
10.0	0.8843	0.1737	-0.1343	0.9062	-0.0068	-1.3183	0.3603
20.0	1.0711	0.3248	-0.3354	1.1613	-0.0857	-1.7458	0.6642
30.0	1.2363	0.5164	-0.6142	1.4659	-0.1923	-2.0330	1.0596
40.0	1.3063	0.7336	-0.9434	1.7616	-0.3204	-2.0732	1.5129
50.0	1.2465	0.9487	-1.2779	2.0123	-0.4549	-1.8285	1.9767
60.0	1.0564	1.1355	-1.5712	2.1982	-0.5821	-1.3196	2.4019
70.0	0.7581	1.2725	-1.7880	2.3123	-0.6846	-0.6848	2.7382
80.0	0.3927	1.3542	-1.9157	2.3688	-0.7587	0.2390	2.9548
90.0	-0.0004	1.3646	-1.9372	2.3599	-0.7894	1.1071	3.0147
100.0	-0.3865	1.3460	-1.9037	2.3535	-0.7817	1.9356	2.9433
110.0	-0.7586	1.2758	-1.8054	2.3186	-0.7448	2.6408	2.7383
120.0	-1.0635	1.1435	-1.5871	2.2172	-0.7297	3.1094	2.4000
130.0	-1.2528	0.9542	-1.2871	2.0246	-0.6393	3.2792	1.9763
140.0	-1.3274	0.7437	-0.9613	1.7909	-0.5293	3.1473	1.5127
150.0	-1.2656	0.5263	-0.6312	1.5008	-0.4089	2.7352	1.0598
160.0	-1.1079	0.3322	-0.3486	1.2011	-0.2947	2.1305	0.6646
170.0	-0.8873	0.1738	-0.1358	0.9093	-0.1971	1.4689	0.3603
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8745	-0.1714	0.1323	0.8960	0.0025	1.3204	-0.3601
200.0	-1.0871	-0.3261	0.3394	1.1778	0.0818	1.7476	-0.6636
210.0	-1.2463	-0.5175	0.6198	1.4770	0.1875	2.0341	-1.0577
220.0	-1.2946	-0.7255	0.9350	1.7454	0.3126	2.0772	-1.5097
230.0	-1.2280	-0.9347	1.2579	1.9825	0.4464	1.8358	-1.9738
240.0	-1.0390	-1.1177	1.5419	2.1598	0.5732	1.3277	-2.3959
250.0	-0.7455	-1.2516	1.7530	2.2696	0.6758	0.6166	-2.7332
260.0	-0.3854	-1.3274	1.8688	2.3143	0.7485	-0.2223	-2.9478
270.0	-0.0005	-1.3511	1.9064	2.3265	0.7868	-1.0985	-3.0126
280.0	0.3857	-1.3310	1.8766	2.3228	0.8019	-1.9369	-2.9408
290.0	0.7476	-1.2552	1.7614	2.2788	0.7821	-2.6330	-2.7273
300.0	1.0470	-1.1247	1.5573	2.1785	0.7283	-3.1024	-2.3947
310.0	1.2366	-0.9401	1.2674	1.9957	0.6389	-3.2735	-1.9726
320.0	1.3056	-0.7306	0.9422	1.7594	0.5282	-3.1402	-1.5100
330.0	1.2480	-0.5178	0.6203	1.4788	0.4100	-2.7317	-1.0578
340.0	1.0856	-0.3258	0.3398	1.1765	0.2951	-2.1275	-0.6637
350.0	0.8814	-0.1723	0.1343	0.9032	0.1971	-1.4672	-0.3601
360.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000

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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

h) ROLL ANGLE = 70°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000
10.0	0.8271	0.1340	-0.1360	0.8446	0.0124	-1.1341	0.2801
20.0	0.9182	0.2225	-0.3119	0.9891	-0.0361	-1.3498	0.4441
30.0	1.0040	0.3284	-0.5013	1.1800	-0.0876	-1.4674	0.6451
40.0	1.0166	0.4405	-0.7954	1.3560	-0.1687	-1.4320	0.8685
50.0	0.9626	0.5554	-1.0680	1.5350	-0.2438	-1.2180	1.0948
60.0	0.8009	0.6491	-1.2885	1.6412	-0.3140	-0.8353	1.2994
70.0	0.5593	0.7103	-1.4335	1.6858	-0.3716	-0.3203	1.4598
80.0	0.2901	0.7499	-1.5332	1.7218	-0.4101	0.2661	1.5553
90.0	-0.0001	0.7587	-1.5492	1.7158	-0.4315	0.8649	1.5833
100.0	-0.2863	0.7463	-1.5245	1.7119	-0.4449	1.4383	1.5516
110.0	-0.5755	0.7237	-1.4729	1.7300	-0.4515	1.9510	1.4588
120.0	-0.8123	0.6570	-1.3118	1.6663	-0.4313	2.2765	1.2969
130.0	-0.9764	0.5628	-1.0864	1.5571	-0.3942	2.4081	1.0929
140.0	-1.0548	0.4521	-0.8276	1.4073	-0.3432	2.3528	0.8677
150.0	-1.0425	0.3359	-0.5646	1.2256	-0.2847	2.0784	0.6447
160.0	-0.9547	0.2267	-0.3259	1.0264	-0.2249	1.7033	0.4440
170.0	-0.8196	0.1331	-0.1362	0.8373	-0.1698	1.2872	0.2798
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8096	-0.1320	0.1334	0.8267	-0.0157	1.1398	-0.2797
200.0	-0.9390	-0.2230	0.3146	1.0107	0.0323	1.3509	-0.4432
210.0	-1.0200	-0.3300	0.5492	1.1928	0.0936	1.4672	-0.6432
220.0	-1.0166	-0.4370	0.7932	1.3539	0.1632	1.4336	-0.8654
230.0	-0.9492	-0.5468	1.0441	1.5049	0.2376	1.2246	-1.0907
240.0	-0.7871	-0.6379	1.2557	1.6044	0.3061	0.8435	-1.2943
250.0	-0.5598	-0.7047	1.4157	1.6680	0.3661	0.3321	-1.4552
260.0	-0.2824	-0.7302	1.4708	1.6561	0.4022	-0.2409	-1.5522
270.0	-0.0002	-0.7508	1.5232	1.6861	0.4318	-0.8576	-1.5831
280.0	0.2868	-0.7413	1.5030	1.6903	0.4470	-1.4391	-1.5505
290.0	0.5647	-0.7115	1.4393	1.6927	0.4498	-1.9418	-1.4543
300.0	0.7936	-0.6428	1.2771	1.6265	0.4294	-2.2661	-1.2940
310.0	0.9546	-0.5499	1.0589	1.5199	0.3921	-2.3994	-1.0948
320.0	1.0435	-0.4460	0.8158	1.3901	0.3440	-2.3288	-0.8656
330.0	1.0201	-0.3288	0.5489	1.1975	0.2853	-2.0751	-0.6436
340.0	0.9318	-0.2224	0.3162	1.0032	0.2245	-1.6997	-0.443
350.0	0.8226	-0.1331	0.1357	0.8401	0.1708	-1.2864	-0.2746
360.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000

ORIGINAL PAGE IS
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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 80°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000
10.0	0.7510	0.0958	-0.1295	0.7606	0.0295	-0.9694	0.2074
20.0	0.7832	0.1332	-0.2782	0.8016	0.0063	-0.9928	0.2650
30.0	0.7902	0.1743	-0.4468	0.8198	-0.0228	-0.9566	0.3298
40.0	0.7531	0.2143	-0.4175	0.9917	-0.0544	-0.8446	0.3972
50.0	0.6811	0.2545	-0.3887	1.0664	-0.0884	-0.6599	0.4648
60.0	0.5435	0.2837	-0.9128	1.0929	-0.1206	-0.4038	0.5259
70.0	0.3707	0.3025	-0.9918	1.0833	-0.1464	-0.0954	0.5721
80.0	0.1798	0.3037	-1.0037	1.0566	-0.1602	0.2199	0.5929
90.0	-0.0002	0.3023	-1.0144	1.0515	-0.1710	0.5402	0.5871
100.0	-0.1819	0.3060	-1.0123	1.0657	-0.1850	0.8615	0.5956
110.0	-0.3840	0.3088	-1.0246	1.1299	-0.2014	1.1822	0.5716
120.0	-0.5559	0.2870	-0.9345	1.1181	-0.2044	1.3929	0.5236
130.0	-0.6927	0.2577	-0.8041	1.0861	-0.2026	1.5098	0.4637
140.0	-0.7844	0.2207	-0.6431	1.0326	-0.1950	1.5255	0.3970
150.0	-0.8329	0.1788	-0.4725	0.9695	-0.1823	1.4496	0.3287
160.0	-0.8114	0.1349	-0.2895	0.8680	-0.1641	1.3000	0.2646
170.0	-0.7537	0.0949	-0.1308	0.7675	-0.1459	1.1106	0.2070
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.7506	-0.0947	0.1298	0.7643	-0.0330	0.9699	-0.2069
200.0	-0.7897	-0.1322	0.2799	0.8443	-0.0093	0.9934	-0.2542
210.0	-0.8051	-0.1741	0.4534	0.9356	0.0196	0.9556	-0.3262
220.0	-0.7589	-0.2140	0.6179	0.9964	0.0517	0.8459	-0.3954
230.0	-0.6842	-0.2520	0.7804	1.0620	0.0847	0.6648	-0.4620
240.0	-0.5370	-0.2779	0.8872	1.0670	0.1161	0.4134	-0.5224
250.0	-0.3789	-0.3026	0.9933	1.0982	0.1440	0.1019	-0.5684
260.0	-0.1806	-0.3029	0.9710	1.0249	0.1593	-0.1991	-0.5954
270.0	-0.0002	-0.3129	1.0245	1.0652	0.1763	-0.5416	-0.5974
280.0	0.1886	-0.3125	1.0244	1.0797	0.1899	-0.8708	-0.5962
290.0	0.3845	-0.3083	1.0217	1.1273	0.2027	-1.1824	-0.5689
300.0	0.5544	-0.2848	0.9297	1.1129	0.2050	-1.3906	-0.5212
310.0	0.6889	-0.2545	0.7973	1.0781	0.2050	-1.5061	-0.4620
320.0	0.7878	-0.2192	0.6435	1.0352	0.1964	-1.5245	-0.3955
330.0	0.8453	-0.1759	0.4592	0.9475	0.1821	-1.4445	-0.3287
340.0	0.7870	-0.1323	0.2788	0.8413	0.1650	-1.2947	-0.2646
350.0	0.7643	-0.0950	0.1320	0.7781	0.1446	-1.1104	-0.2070
360.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 90°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	0.9083	0.0000	-0.1592	0.9221	0.0966	-1.3580	-0.0159
20.0	0.8691	-0.0001	-0.3133	0.9238	0.0898	-1.1961	-0.0306
30.0	0.8104	-0.0001	-0.4651	0.9344	0.0793	-0.9935	-0.0428
40.0	0.7212	-0.0004	-0.5999	0.9381	0.0672	-0.7599	-0.0522
50.0	0.6095	-0.0006	-0.7157	0.9401	0.0516	-0.5157	-0.0562
60.0	0.4562	-0.0011	-0.7777	0.9016	0.0354	-0.2636	-0.0548
70.0	0.2978	-0.0012	-0.8043	0.8576	0.0220	-0.0230	-0.0521
80.0	0.1159	-0.0015	-0.7409	0.6512	0.0088	0.1422	-0.0386
90.0	-0.0006	-0.0008	-0.6478	0.6478	0.0000	0.3502	-0.0354
100.0	-0.1350	-0.0004	-0.7544	0.7664	-0.0072	0.5925	-0.0377
110.0	-0.3055	-0.0002	-0.8230	0.8728	-0.0225	0.8694	-0.0547
120.0	-0.4627	0.0003	-0.7865	0.9125	-0.0369	1.0894	-0.0577
130.0	-0.6170	0.0007	-0.7261	0.9528	-0.0528	1.2754	-0.0579
140.0	-0.7366	0.0007	-0.6128	0.9582	-0.0678	1.4120	-0.0529
150.0	-0.8416	0.0003	-0.4839	0.9708	-0.0818	1.5041	-0.0443
160.0	-0.8885	0.0003	-0.3217	0.9450	-0.0917	1.5422	-0.0313
170.0	-0.9100	0.0001	-0.1605	0.9241	-0.0986	1.5347	-0.0164
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8968	-0.0001	0.1569	0.9104	-0.0978	1.3588	0.0162
200.0	-0.8710	0.0004	0.3138	0.9258	-0.0910	1.1955	0.0310
210.0	-0.8141	-0.0002	0.4660	0.9380	-0.0806	0.9932	0.0434
220.0	-0.7027	-0.0003	0.5806	0.9115	-0.0672	0.7659	0.0523
230.0	-0.6158	0.0001	0.7113	0.9404	-0.0512	0.5224	0.0558
240.0	-0.4450	0.0001	0.7410	0.8642	-0.0356	0.2767	0.0550
250.0	-0.3063	-0.0001	0.8095	0.8654	-0.0223	0.0291	0.0536
260.0	-0.1498	-0.0003	0.8111	0.8248	-0.0103	-0.1951	0.0504
270.0	-0.0006	-0.0008	0.8689	0.8689	0.0000	-0.4464	0.0500
280.0	0.1508	-0.0008	0.8219	0.8356	0.0091	-0.6458	0.0411
290.0	0.3118	-0.0005	0.8354	0.8916	0.0230	-0.8869	0.0547
300.0	0.4688	0.0001	0.7960	0.9257	0.0373	-1.0950	0.0582
310.0	0.6098	-0.0001	0.7147	0.9394	0.0528	-1.2700	0.0576
320.0	0.7478	-0.0003	0.6189	0.9706	0.0683	-1.4125	0.0530
330.0	0.8211	0.0001	0.4691	0.9456	0.0809	-1.4979	0.0436
340.0	0.8728	0.0004	0.3150	0.9279	0.0907	-1.5398	0.0309
350.0	0.9049	-0.0005	0.1581	0.9186	0.0983	-1.5532	0.0163
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTE'ISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 100°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	0.7497	-0.0948	-0.1292	0.7632	0.1436	-0.9698	-0.2358
20.0	0.7908	-0.1334	-0.2911	0.8097	0.1636	-0.9934	-0.3217
30.0	0.8019	-0.1753	-0.4526	0.8305	0.1808	-0.9564	-0.4135
40.0	0.7614	-0.2163	-0.6233	1.0020	0.1943	-0.8435	-0.5044
50.0	0.6898	-0.2567	-0.7973	1.0788	0.2038	-0.6549	-0.5884
60.0	0.5506	-0.2855	-0.9235	1.1050	0.2045	-0.3969	-0.6540
70.0	0.3870	-0.3053	-1.0208	1.1268	0.2002	-0.0859	-0.6906
80.0	0.1850	-0.3001	-1.0085	1.0615	0.1784	0.2202	-0.6835
90.0	-0.0006	-0.3016	-1.0148	1.0517	0.1649	0.5397	-0.6856
100.0	-0.1849	-0.3085	-1.0219	1.0758	0.1658	0.8692	-0.7032
110.0	-0.3438	-0.3096	-1.0288	1.1292	0.1858	1.1824	-0.7064
120.0	-0.5510	-0.2860	-0.9261	1.1084	0.1193	1.3914	-0.6564
130.0	-0.6877	-0.2552	-0.7989	1.0766	0.0878	1.5077	-0.5865
140.0	-0.7774	-0.2175	-0.6382	1.0238	0.0532	1.5237	-0.5060
150.0	-0.8216	-0.1772	-0.4657	0.9562	0.0208	1.4479	-0.4149
160.0	-0.8020	-0.1340	-0.2861	0.8580	-0.0090	1.2987	-0.3226
170.0	-0.7543	-0.0951	-0.1317	0.7683	-0.0330	1.1107	-0.2359
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.7820	0.0940	0.1279	0.7558	-0.1028	0.9701	0.2358
200.0	-0.7940	0.1340	0.2825	0.8492	-0.1624	0.9934	0.3217
210.0	-0.8055	0.1753	0.4551	0.9369	-0.1792	0.9558	0.4129
220.0	-0.7688	0.2178	0.6287	1.0112	-0.1935	0.8430	0.5039
230.0	-0.6989	0.2567	0.7984	1.0832	-0.2022	0.6578	0.5877
240.0	-0.5434	0.2832	0.9034	1.0847	-0.2027	0.4041	0.6537
250.0	-0.3813	0.3067	1.0143	1.1191	-0.1984	0.0881	0.6967
260.0	-0.1808	0.3086	1.0037	1.0576	-0.1841	-0.2195	0.7072
270.0	0.0002	0.3112	1.0157	1.0543	-0.1753	-0.5360	0.7039
280.0	0.1901	0.3149	1.0382	1.0937	-0.1678	-0.8725	0.7072
290.0	0.3893	0.3110	1.0351	1.1418	-0.1482	-1.1860	0.7035
300.0	0.5618	0.2890	0.9426	1.1283	-0.1207	-1.3941	0.6545
310.0	0.6975	0.2580	0.8075	1.0918	-0.0891	-1.5090	0.5867
320.0	0.7930	0.2207	0.6476	1.0421	-0.0551	-1.5252	0.5044
330.0	0.8150	0.1772	0.4587	0.9478	-0.0226	-1.4433	0.4130
340.0	0.7976	0.1349	0.2826	0.8527	0.0062	-1.2952	0.3214
350.0	0.7653	0.0958	0.1319	0.7741	0.0305	-1.1094	0.2353
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 110°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000
10.0	0.8159	-0.1324	-0.1342	0.8328	-0.1690	-1.1395	-0.3082
20.0	0.9321	-0.2230	-0.3168	1.0038	0.2239	-1.3511	-0.5047
30.0	1.0213	-0.3306	-0.5507	1.1997	0.2845	-1.4665	-0.7806
40.0	1.0364	-0.4446	-0.8104	1.3811	0.3457	-1.4278	-0.9977
50.0	0.9601	-0.5516	-1.0649	1.5282	0.3902	-1.2067	-1.2429
60.0	0.7782	-0.6287	-1.2526	1.5946	0.4148	-0.8227	-1.4410
70.0	0.5545	-0.6949	-1.4130	1.6607	0.4335	-0.3180	-1.6028
80.0	0.2872	-0.7361	-1.5077	1.6931	0.4403	0.2609	-1.7153
90.0	-0.0005	-0.7482	-1.5237	1.6864	0.4273	0.8560	-1.7529
100.0	-0.2864	-0.7390	-1.5116	1.6975	0.4099	1.4366	-1.7124
110.0	-0.5681	-0.7189	-1.4536	1.7076	0.3708	1.9407	-1.6403
120.0	-0.8018	-0.6497	-1.2938	1.6462	0.3125	2.2757	-1.4770
130.0	-0.9638	-0.5560	-1.0727	1.5373	0.2418	2.4046	-1.2527
140.0	-1.0415	-0.4466	-0.8176	1.3898	0.1669	2.3301	-0.9986
150.0	-1.0351	-0.3337	-0.5607	1.2169	0.0954	2.0774	-0.7418
160.0	-0.9440	-0.2259	-0.3217	1.0167	0.0351	1.7024	-0.5057
170.0	-0.8197	-0.1332	-0.1364	0.8374	-0.0156	1.2871	-0.3088
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8070	0.1318	0.1330	0.8243	-0.1687	1.1399	0.3083
200.0	-0.9425	0.2256	0.3208	1.0152	-0.2254	1.5508	0.5046
210.0	-1.0296	0.3336	0.5566	1.2102	-0.2824	1.4855	0.7746
220.0	-1.0423	0.4467	0.8176	1.3905	-0.3421	1.4264	0.9968
230.0	-0.9533	0.5509	1.0590	1.5193	-0.3879	1.2049	1.2427
240.0	-0.7676	0.6522	1.2411	1.5810	-0.4144	0.8199	1.4472
250.0	-0.5490	0.7040	1.4194	1.6674	-0.4349	0.3063	1.6122
260.0	-0.2810	0.7360	1.4924	1.6779	-0.4382	-0.2549	1.7163
270.0	0.0003	0.7520	1.5325	1.6972	-0.4305	-0.8559	1.7513
280.0	0.2877	0.7482	1.5252	1.7134	-0.4140	-1.4365	1.7184
290.0	0.5714	0.7200	1.4623	1.7181	-0.3741	-1.9392	1.6371
300.0	0.8115	0.6549	1.3071	1.6835	-0.3154	-2.2758	1.4729
310.0	0.9785	0.5616	1.0865	1.5562	-0.2452	-2.4077	1.2496
320.0	1.0521	0.4498	0.8224	1.4016	-0.1699	-2.3297	0.9957
330.0	1.0309	0.3333	0.5546	1.2105	-0.0984	-2.0734	0.7392
340.0	0.9415	0.2258	0.3141	1.0137	-0.0365	-1.6986	0.5041
350.0	0.8312	0.1547	0.1367	0.8468	0.0125	-1.2860	0.3081
360.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000

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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = 120°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	0.8849	-0.1730	-0.1347	0.9067	0.1969	-1.3196	-0.3877
20.0	1.0878	-0.3269	-0.3410	1.1791	0.2940	-1.7471	-0.7266
30.0	1.2532	-0.4868	-0.6230	1.4051	0.4162	-2.0322	-1.1627
40.0	1.3147	-0.7352	-0.9500	1.7722	0.5304	-2.0692	-1.6568
50.0	1.3258	-0.9319	-1.2564	1.9781	0.6307	-1.8164	-2.1401
60.0	1.0285	-1.1038	-1.5304	2.1000	0.7070	-1.3060	-2.5638
70.0	0.7461	-1.2514	-1.7587	2.2665	0.7754	-0.6827	-2.9374
80.0	0.3893	-1.3410	-1.8968	2.3455	0.8043	0.2367	-3.1737
90.0	-0.0005	-1.3525	-1.9141	2.3339	0.7841	1.0980	-3.2391
100.0	-0.3938	-1.3495	-1.9134	2.3646	0.7574	1.9502	-3.1715
110.0	-0.7567	-1.2686	-1.7865	2.3084	0.6831	2.6381	-2.9536
120.0	-1.0581	-1.1372	-1.5781	2.2050	0.5790	3.1071	-2.6134
130.0	-1.2473	-0.9484	-1.2820	2.0156	0.4516	3.2776	-2.1605
140.0	-1.3191	-0.7386	-0.9562	1.7802	0.3178	3.1456	-1.6589
150.0	-1.2652	-0.5347	-0.6322	1.5006	0.1985	2.7345	-1.1637
160.0	-1.0978	-0.3289	-0.3459	1.1903	0.0831	2.1287	-0.7275
170.0	-0.8857	-0.1733	-0.1357	0.9077	0.0030	1.4686	-0.3883
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8762	0.1728	0.1329	0.8870	-0.1962	1.3208	0.3878
200.0	-1.0953	0.3306	0.3434	1.1873	-0.2934	1.7464	0.7265
210.0	-1.2607	0.5248	0.6287	1.4952	-0.4079	2.0304	1.1617
220.0	-1.3153	0.7364	0.9520	1.7742	-0.5284	2.0697	1.6566
230.0	-1.2218	0.9386	1.2988	1.9263	-0.6288	1.8128	2.1411
240.0	-1.0127	1.1041	1.5160	2.1214	-0.7038	1.3006	2.5685
250.0	-0.7425	1.2572	1.7635	2.2798	-0.7728	0.5954	2.9359
260.0	-0.3861	1.3397	1.8912	2.3396	-0.8001	-0.2346	3.1674
270.0	0.0000	1.3601	1.9252	2.3473	-0.7871	-1.0996	3.2333
280.0	0.3906	1.3513	1.9126	2.3643	-0.7604	-1.9445	3.1668
290.0	0.7507	1.2663	1.7790	2.2994	-0.6872	-2.6225	2.9384
300.0	1.0613	1.1387	1.5790	2.2079	-0.5850	-3.1088	2.6084
310.0	1.2582	0.9552	1.2898	2.0303	-0.4572	-3.2802	2.1558
320.0	1.3270	0.7422	0.9580	1.7884	-0.3225	-3.1452	1.6550
330.0	1.2585	0.5235	0.6248	1.6813	-0.1945	-2.7318	1.1607
340.0	1.1056	0.3320	0.3456	1.1961	-0.0872	-2.1280	0.7260
350.0	0.8988	0.1759	0.1363	0.9209	-0.0068	-1.4679	0.3876
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

n) ROLL ANGLE = 130°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	0.9534	-0.2133	-0.1290	0.9798	0.2249	-1.4999	-0.4694
20.0	1.2531	-0.4407	-0.3479	1.3656	0.5708	-2.1456	-0.9713
30.0	1.4755	-0.7309	-0.6508	1.7620	0.5477	-2.5955	-1.6428
40.0	1.5654	-1.0584	-1.0021	2.1299	0.7377	-2.7100	-2.4195
50.0	1.4807	-1.3717	-1.3451	2.4165	0.9099	-2.4425	-3.2010
60.0	1.2663	-1.6666	-1.6696	2.6685	1.0619	-1.8359	-3.9262
70.0	0.9246	-1.9017	-1.9300	2.8542	1.1225	-0.9483	-4.5059
80.0	0.4837	-2.0445	-2.0879	2.9532	1.2262	0.1163	-4.8819
90.0	-0.0006	-2.0654	-2.1106	2.9444	1.2040	1.2203	-4.9876
100.0	-0.4676	-2.0558	-2.1025	2.9721	1.1668	2.3117	-4.8837
110.0	-0.9282	-1.9089	-1.9409	2.8676	1.0501	3.1863	-4.5073
120.0	-1.2848	-1.6902	-1.6973	2.7093	0.8912	3.7901	-3.9463
130.0	-1.5050	-1.3939	-1.3690	2.4571	0.6971	4.0207	-3.2192
140.0	-1.5741	-1.0650	-1.0101	2.1432	0.4925	3.8609	-2.4219
150.0	-1.4827	-0.7345	-0.6559	1.7714	0.2992	3.3362	-1.6440
160.0	-1.2507	-0.4401	-0.3468	1.3635	0.1377	2.5368	-0.9722
170.0	-0.9591	-0.2139	-0.1297	0.9857	0.0215	1.6437	-0.4700
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.9458	0.2124	0.1273	0.9720	-0.2237	1.5007	0.4695
200.0	-1.2486	0.4414	0.3465	1.3612	-0.3680	2.1468	0.9712
210.0	-1.4753	0.7330	0.6514	1.7627	-0.5439	2.5961	1.6414
220.0	-1.5677	1.0627	1.0050	2.1348	-0.7346	2.7106	2.4188
230.0	-1.4840	1.3812	1.3512	2.4269	-0.9067	2.4372	3.1995
240.0	-1.2579	1.6634	1.6611	2.6569	-1.0569	1.8364	3.9260
250.0	-0.9243	1.9075	1.9350	2.8612	-1.1713	0.9467	4.5072
260.0	-0.4845	2.0500	2.0929	2.9607	-1.2264	-0.1172	4.8767
270.0	-0.0004	2.0715	2.1159	2.9524	-1.2078	-1.2222	4.9846
280.0	0.4866	2.0582	2.1040	2.9746	-1.1698	-2.3094	4.8774
290.0	0.9318	1.9182	1.9482	2.8796	-1.0566	-3.1880	4.5083
300.0	1.2913	1.6970	1.7025	2.7198	-0.8972	-3.7915	3.9347
310.0	1.5126	1.3998	1.3747	2.4682	-0.7033	-4.0216	3.2156
320.0	1.5611	1.0574	0.9972	2.1237	-0.4970	-3.8564	2.4162
330.0	1.4789	0.7332	0.6504	1.7655	-0.3039	-3.3334	1.6405
340.0	1.2608	0.4445	0.3498	1.3741	-0.1452	-2.5570	0.9706
350.0	0.9600	0.2157	0.1292	0.9867	-0.0262	-1.6429	0.4692
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

o) ROLL ANGLE = 140°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_β	C_m	C_n	C_ℓ
0.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000
10.0	1.0111	-0.2501	-0.1150	1.0418	0.2507	-1.6706	-0.5475
20.0	1.3710	-0.5449	-0.3193	1.5013	0.4436	-2.5243	-1.2170
30.0	1.6430	-0.9317	-0.6062	1.8754	0.6338	-3.1289	-2.1341
40.0	1.7624	-1.3722	-0.9455	2.4164	0.9443	-3.3246	-3.2053
50.0	1.7030	-1.8235	-1.2977	2.8037	1.1984	-3.0680	-4.3102
60.0	1.4602	-2.2291	-1.6157	3.1003	1.4107	-2.3878	-5.3240
70.0	1.0637	-2.5413	-1.8634	3.3208	1.5729	-1.3638	-6.1299
80.0	0.5584	-2.7455	-2.0226	3.4484	1.6566	-0.1153	-6.6508
90.0	-0.0005	-2.7773	-2.0451	3.4421	1.6359	1.1998	-6.8069
100.0	-0.5594	-2.7457	-2.0225	3.4407	1.5806	2.4886	-6.6505
110.0	-1.0662	-2.5918	-1.9096	3.3309	1.4254	3.5499	-6.1335
120.0	-1.4625	-2.2334	-1.6185	3.1139	1.2088	4.2799	-5.3260
130.0	-1.7078	-1.8292	-1.3022	2.8123	0.9459	4.5841	-4.3121
140.0	-1.7764	-1.3827	-0.9554	2.4363	0.6685	4.4273	-3.2067
150.0	-1.6958	-0.9378	-0.6128	1.9894	0.4075	3.8306	-2.1353
160.0	-1.3802	-0.5476	-0.3222	1.5113	0.1924	2.8907	-1.2180
170.0	-1.0177	-0.2517	-0.1157	1.0486	0.0369	1.7993	-0.5481
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0122	0.2518	0.1166	1.0431	-0.2497	1.6711	0.5476
200.0	-1.3917	0.5535	0.3250	1.5243	-0.4406	2.5237	1.2165
210.0	-1.6628	0.9432	0.6151	1.9989	-0.6795	3.1266	2.1324
220.0	-1.7885	1.3937	0.9630	2.4542	-0.9425	3.3199	3.2023
230.0	-1.7319	1.8562	1.3247	2.8588	-1.1991	3.0618	4.3062
240.0	-1.4831	2.2661	1.6462	3.1612	-1.4184	2.3807	5.3183
250.0	-1.0814	2.5890	1.9005	3.3815	-1.5786	1.3556	6.1246
260.0	-0.5671	2.7844	2.0547	3.4996	-1.6631	0.1074	6.6405
270.0	-0.0004	2.8072	2.0678	3.4795	-1.6452	-1.2050	6.7991
280.0	0.5669	2.7841	2.0548	3.4994	-1.5925	-2.4948	6.6413
290.0	1.0849	2.5915	1.9032	3.3861	-1.4408	-3.5579	6.1216
300.0	1.4872	2.2682	1.6474	3.1654	-1.2218	-4.2846	5.3165
310.0	1.7340	1.8545	1.3238	2.8547	-0.9588	-4.5884	4.3049
320.0	1.7945	1.3951	0.9643	2.4600	-0.6790	-4.4290	3.2012
330.0	1.6684	0.9442	0.6155	2.0043	-0.4164	-3.8308	2.1314
340.0	1.3989	0.5540	0.3259	1.5313	-0.1989	-2.8909	1.2161
350.0	1.0185	0.2525	0.1151	1.0494	-0.0440	-1.7983	0.5472
360.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

p) ROLL ANGLE = 150°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000
10.0	1.0601	-0.2823	-0.0943	1.0946	0.2721	-1.8198	-0.6157
20.0	1.4813	-0.6411	-0.2685	1.6277	0.5080	-2.8557	-1.4385
30.0	1.8020	-1.1213	-0.5179	2.1756	0.8065	-3.5988	-2.5814
40.0	1.9376	-1.6674	-0.8093	2.6725	1.1328	-3.8803	-3.9232
50.0	1.8764	-2.2289	-1.1136	3.1113	1.4536	-3.6501	-5.3123
60.0	1.6151	-2.7409	-1.3921	3.4660	1.7337	-2.9354	-6.5911
70.0	1.1790	-3.1820	-1.6105	3.7168	1.9389	-1.8208	-7.6143
80.0	0.6194	-3.3926	-1.7482	3.8617	2.0490	-0.4364	-8.2722
90.0	-0.0004	-3.4501	-1.7775	3.8771	2.0400	1.0473	-8.4805
100.0	-0.6204	-3.3939	-1.7482	3.8630	1.9657	2.4974	-8.2707
110.0	-1.1811	-3.1482	-1.6139	3.7243	1.7763	3.7173	-7.6167
120.0	-1.6187	-2.7483	-1.3953	3.4747	1.5065	4.5729	-6.5933
130.0	-1.8830	-2.2377	-1.1178	3.1230	1.1796	4.9585	-5.3145
140.0	-1.9523	-1.6792	-0.8167	2.6927	0.8350	4.8294	-3.9250
150.0	-1.8073	-1.1245	-0.5198	2.1820	0.5100	4.2013	-2.5829
160.0	-1.4947	-0.6462	-0.2716	1.6424	0.2427	3.1656	-1.4395
170.0	-1.0665	-0.2838	-0.0947	1.1012	0.0544	1.9259	-0.6164
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0636	0.2852	0.0935	1.0985	-0.2716	1.8207	0.6159
200.0	-1.5003	0.6507	0.2725	1.6492	-0.5051	2.8553	1.4361
210.0	-1.8155	1.1326	0.5221	2.1932	-0.8017	3.5983	2.5801
220.0	-1.9598	1.6896	0.8205	2.7055	-1.1300	3.8778	3.9209
230.0	-1.9012	2.2628	1.1319	3.1565	-1.4533	3.6462	5.3089
240.0	-1.6381	2.7849	1.4168	3.5211	-1.7359	2.9282	6.5842
250.0	-1.1949	3.1879	1.6359	3.7715	-1.9436	1.8156	7.6085
260.0	-0.6279	3.4377	1.7727	3.9138	-2.0565	0.4319	8.2618
270.0	-0.0005	3.4805	1.7926	3.9105	-2.0491	-1.0503	8.4745
280.0	0.6287	3.4413	1.7761	3.9167	-1.9802	-2.5035	8.2651
290.0	1.1986	3.1923	1.6390	3.7778	-1.7925	-3.7229	7.6066
300.0	1.6433	2.7873	1.4185	3.5263	-1.5216	-4.5776	6.5851
310.0	1.9083	2.2658	1.1344	3.1643	-1.1936	-4.9617	5.3079
320.0	1.9704	1.6940	0.8239	2.7171	-0.8466	-4.8308	3.9202
330.0	1.8199	1.1328	0.5227	2.1971	-0.5194	-4.2006	2.5792
340.0	1.5028	0.6497	0.2725	1.6512	-0.2491	-3.1647	1.4375
350.0	1.0609	0.2835	0.0935	1.0955	-0.0592	-1.9251	0.6155
360.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000

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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

q) ROLL ANGLE = 160°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000
10.0	1.1033	-0.3081	-0.0671	1.1408	0.2903	-1.9400	-0.6684
20.0	1.5620	-0.7174	-0.1938	1.7210	0.5579	-3.1242	-1.6130
30.0	1.9135	-1.2693	-0.3756	2.3174	0.9042	-3.9910	-2.9360
40.0	2.0780	-1.9131	-0.5937	2.8779	1.2852	-4.3592	-4.4947
50.0	2.0076	-2.5577	-0.8144	3.3449	1.6583	-4.1752	-6.1101
60.0	1.7253	-3.1466	-1.0173	3.7246	1.9848	-3.4602	-7.5986
70.0	1.2590	-3.6107	-1.1770	3.9972	2.2271	-2.3015	-8.7963
80.0	0.6647	-3.9110	-1.2812	4.1662	2.3634	-0.8318	-9.5683
90.0	-0.0003	-4.0079	-1.3129	4.2152	2.4118	0.7753	-9.8252
100.0	-0.6675	-3.9202	-1.2840	4.1761	2.2768	2.3483	-9.5669
110.0	-1.2638	-3.6248	-1.1823	4.0124	2.0576	3.6949	-8.7996
120.0	-1.7319	-3.1588	-1.0223	3.7394	1.7450	4.6642	-7.6043
130.0	-2.0164	-2.5703	-0.8183	3.3607	1.3693	5.1367	-6.1142
140.0	-2.0786	-1.9138	-0.5939	2.8788	0.9667	5.0545	-4.4966
150.0	-1.9241	-1.2765	-0.3785	2.3308	0.5936	4.4312	-2.9382
160.0	-1.5811	-0.7242	-0.1964	1.7415	0.2854	3.3490	-1.6140
170.0	-1.1084	-0.3090	-0.0674	1.1460	0.0672	2.0158	-0.6690
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0968	0.3092	0.0660	1.1345	-0.2880	1.9407	0.6686
200.0	-1.5765	0.7257	0.1956	1.7375	-0.5557	3.1240	1.6131
210.0	-1.9307	1.2849	0.3794	2.3406	-0.8992	3.9902	2.9359
220.0	-2.0803	1.9203	0.5946	2.8842	-1.2782	4.3589	4.4931
230.0	-2.0161	2.5763	0.8186	3.3651	-1.6531	4.1714	6.1051
240.0	-1.7421	3.1833	1.0309	3.7669	-1.9855	3.4574	7.5967
250.0	-1.2714	3.6514	1.1919	4.0421	-2.2309	2.2984	8.7930
260.0	-0.6707	3.9443	1.2934	4.2022	-2.3691	0.8298	9.5603
270.0	-0.0005	4.0209	1.3174	4.2289	-2.3760	-0.7753	9.8182
280.0	0.6692	3.9374	1.2909	4.1946	-2.2833	-2.3485	9.5621
290.0	1.2749	3.6555	1.1940	4.0476	-2.0692	-3.6966	8.7919
300.0	1.7502	3.1914	1.0343	3.7785	-1.7596	-4.6668	7.5982
310.0	2.0341	2.5924	0.8272	3.3903	-1.3829	-5.1587	6.1092
320.0	2.0938	1.9284	0.5982	2.9001	-0.9806	-5.0549	4.4925
330.0	1.9459	1.2908	0.3828	2.3571	-0.6056	-4.4314	2.9350
340.0	1.5835	0.7270	0.1964	1.7446	-0.2909	-3.3482	1.6123
350.0	1.1065	0.3098	0.0670	1.1402	-0.0716	-2.0148	0.6682
360.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

r) ROLL ANGLE = 170°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000
10.0	1.1288	-0.3243	-0.0355	1.1681	0.5016	-2.0230	-0.7008
20.0	1.6241	-0.7703	-0.1030	1.7917	0.5925	-3.3160	-1.7223
30.0	1.9918	-1.3714	-0.1988	2.4175	0.9688	-4.2850	-3.1606
40.0	2.1583	-2.0669	-0.3144	2.9968	1.3823	-4.7392	-4.8563
50.0	2.0929	-2.7766	-0.4319	3.4973	1.7914	-4.6132	-6.6121
60.0	1.7972	-3.4150	-0.5379	3.8919	2.1475	-3.9296	-8.2341
70.0	1.3106	-3.9195	-0.6235	4.1771	2.4125	-2.7668	-9.5396
80.0	0.6944	-4.2610	-0.6807	4.3694	2.5718	-1.2616	-10.3905
90.0	-0.0004	-4.3776	-0.6990	4.4324	2.5907	0.4133	-10.6802
100.0	-0.6958	-4.2634	-0.6810	4.3720	2.4782	2.0666	-10.3888
110.0	-1.3197	-3.9467	-0.6281	4.2061	2.2427	3.5079	-9.5498
120.0	-1.8069	-3.4342	-0.5416	3.9137	1.9017	4.5701	-8.2446
130.0	-2.1030	-2.7917	-0.4337	3.5155	1.4935	5.1261	-6.6198
140.0	-2.1682	-2.0770	-0.3154	3.0109	1.0579	5.1079	-4.8583
150.0	-2.0065	-1.3817	-0.2017	2.4355	0.6499	4.5181	-3.1616
160.0	-1.6346	-0.7746	-0.1041	1.8031	0.3091	3.4351	-1.7232
170.0	-1.1363	-0.3264	-0.0360	1.1759	0.0751	2.0632	-0.7012
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1222	0.3255	0.0345	1.1619	-0.2990	2.0241	0.7010
200.0	-1.6312	0.7768	0.1051	1.8006	-0.5888	3.3164	1.7227
210.0	-2.0015	1.3829	0.1998	2.4316	-0.9619	4.2848	3.1604
220.0	-2.1620	2.0760	0.3142	3.0054	-1.3764	4.7393	4.8560
230.0	-2.0995	2.7937	0.4342	3.5148	-1.7869	4.6132	6.6129
240.0	-1.8032	3.4365	0.5421	3.9140	-2.1432	3.9251	8.2297
250.0	-1.3180	3.9500	0.6290	4.2067	-2.4146	2.7652	9.5408
260.0	-0.6964	4.2731	0.6852	4.3820	-2.5699	1.2622	10.3851
270.0	-0.0006	4.3763	0.6990	4.4311	-2.5905	-0.4116	10.6745
280.0	0.6967	4.2769	0.6845	4.3858	-2.4343	-2.0665	10.3872
290.0	1.3224	3.9553	0.6310	4.2154	-2.2482	-3.5077	9.5446
300.0	1.8152	3.4505	0.5449	3.9323	-1.9128	-4.5710	8.2410
310.0	2.1072	2.7981	0.4353	3.5252	-1.5029	-5.1261	6.6164
320.0	2.1714	2.0807	0.3159	3.0157	-1.0675	-5.1071	4.8550
330.0	2.0134	1.3873	0.2019	2.4443	-0.6598	-4.5176	3.1593
340.0	1.6431	0.7791	0.1041	1.8126	-0.3172	-3.4347	1.7219
350.0	1.1367	0.3265	0.0351	1.1763	-0.0792	-2.0624	0.7006
360.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

s) ROLL ANGLE = 180°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	1.1388	-0.3304	0.0003	1.1788	0.3056	-2.0655	-0.7097
20.0	1.6453	-0.7888	0.0000	1.8159	0.6054	-3.4224	-1.7543
30.0	2.0262	-1.3185	-0.0002	2.4592	0.9050	-4.4652	-3.2272
40.0	2.1881	-2.1228	-0.0001	3.0407	1.4178	-4.9958	-4.9655
50.0	2.1229	-2.8541	-0.0002	3.5509	1.8395	-4.9395	-6.7664
60.0	1.8166	-3.4997	0.0000	3.9384	2.2015	-4.3085	-8.4276
70.0	1.3271	-4.0219	-0.0001	4.2978	2.4758	-3.1805	-9.7658
80.0	0.7034	-4.3718	-0.0001	4.4275	2.6385	-1.6890	-10.6421
90.0	-0.0008	-4.5123	0.0000	4.5123	2.6710	0.0008	-10.9496
100.0	-0.7150	-4.3751	-0.0001	4.4310	2.5452	1.6903	-10.6430
110.0	-1.3581	-3.8553	-0.0001	4.2688	2.3052	3.1856	-9.7814
120.0	-1.8316	-3.5288	-0.0003	3.9718	1.9555	4.3159	-8.4421
130.0	-2.1296	-2.8649	-0.0003	3.5635	1.5352	4.9447	-6.7748
140.0	-2.1890	-2.1245	-0.0003	3.0425	1.0866	4.9965	-4.9673
150.0	-2.0309	-1.4158	-0.0004	2.4667	0.6685	4.4655	-3.2282
160.0	-1.6522	-0.7918	-0.0004	1.8233	0.3185	3.4227	-1.7549
170.0	-1.1431	-0.3319	-0.0005	1.1834	0.0774	2.0658	-0.7100
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1352	0.3324	-0.0001	1.1754	-0.3029	2.0658	0.7101
200.0	-1.6556	0.7971	-0.0002	1.8283	-0.6005	3.4227	1.7549
210.0	-2.0301	1.4198	-0.0002	2.4680	-0.9843	4.4655	3.2283
220.0	-2.1962	2.1367	0.0000	3.0558	-1.4115	4.9965	4.9672
230.0	-2.1297	2.8721	0.0000	3.5690	-1.8339	4.9402	6.7696
240.0	-1.8232	3.5226	0.0002	3.9622	-2.1983	4.3066	8.4289
250.0	-1.3271	4.0349	0.0003	4.2454	-2.4715	3.1785	9.7682
260.0	-0.7031	4.3710	-0.0003	4.4266	-2.6355	1.6903	10.6428
270.0	-0.0007	4.5132	0.0000	4.5132	-2.6721	0.0008	10.9496
280.0	0.7027	4.3698	0.0000	4.4254	-2.5453	-1.6890	10.6420
290.0	1.3333	3.8414	-0.0001	4.2536	-2.3064	-3.1849	9.7773
300.0	1.8300	3.5272	-0.0004	3.9696	-1.9626	-4.3155	8.4398
310.0	2.1239	2.8590	-0.0003	3.5553	-1.5426	-4.9442	6.7725
320.0	2.1924	2.1291	-0.0001	3.0479	-1.0971	-4.9959	4.9656
330.0	2.0347	1.4198	0.0001	2.4720	-0.6789	-4.4652	3.2272
340.0	1.6485	0.7912	-0.0001	1.8197	-0.3249	-3.4220	1.7541
350.0	1.1438	0.3323	0.0001	1.1841	-0.0831	-2.0649	0.7096
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

t) ROLL ANGLE = 190°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	1.1264	-0.3237	-0.0352	1.1657	0.3013	-2.0650	-0.6943
20.0	1.6223	-0.7693	0.1031	1.7897	0.5916	-3.4354	-1.7055
30.0	1.9950	-1.3734	0.2002	2.4213	0.9690	-4.5180	-3.1296
40.0	2.1627	-2.0704	0.3139	3.0023	1.3835	-5.1065	-4.8098
50.0	2.0930	-2.7768	0.4318	3.4975	1.7901	-5.1178	-6.5483
60.0	1.7970	-3.4146	0.5383	3.8916	2.1445	-4.5589	-8.1528
70.0	1.3094	-3.9155	0.6230	4.1729	2.4080	-3.4989	-9.4473
80.0	0.6953	-4.2546	0.6810	4.3751	2.5721	-2.0656	-10.3063
90.0	-0.0004	-4.3786	0.6986	4.4336	2.5903	-0.4115	-10.5870
100.0	-0.6957	-4.2624	0.6804	4.3710	2.4772	1.2627	-10.2986
110.0	-1.3193	-3.9451	0.6275	4.2044	2.2416	2.7682	-9.4449
120.0	-1.8046	-3.4300	0.5400	3.9068	1.9004	3.9556	-8.1698
130.0	-2.1024	-2.7911	0.4334	3.5146	1.4935	4.6171	-6.5577
140.0	-2.1735	-2.0819	0.3160	3.0181	1.0594	4.7389	-4.8110
150.0	-2.0042	-1.3803	0.2009	2.4328	0.6489	4.2847	-3.1301
160.0	-1.6346	-0.7743	0.1036	1.8029	0.3092	3.3162	-1.7057
170.0	-1.1345	-0.3258	0.0349	1.1740	0.0748	2.0242	-0.6945
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1255	0.3266	-0.0347	1.1653	-0.2991	2.0632	0.6948
200.0	-1.6340	0.7782	-0.1035	1.6838	-0.5892	3.4550	1.7065
210.0	-2.0022	1.3833	-0.2062	2.4524	-0.9620	4.5176	3.1313
220.0	-2.1703	2.0838	-0.3155	3.0168	-1.3782	5.1077	4.8129
230.0	-2.1013	2.7959	-0.4343	3.5177	-1.7863	5.1209	6.5552
240.0	-1.7998	3.4315	-0.5402	3.9077	-2.1585	4.5568	8.1564
250.0	-1.3128	3.9401	-0.6265	4.1974	-2.4067	3.4987	9.4508
260.0	-0.6970	4.2782	-0.6839	4.3871	-2.5793	2.0869	10.3021
270.0	-0.0006	4.3745	-0.6989	4.4295	-2.5887	0.4129	10.5920
280.0	0.6953	4.2684	-0.6831	4.3772	-2.4802	-1.2614	10.3034
290.0	1.3191	3.9453	-0.6289	4.2047	-2.2437	-2.7678	9.4652
300.0	1.8152	3.4469	-0.5437	3.9281	-1.9112	-3.9329	8.1705
310.0	2.1068	2.7913	-0.4354	3.5224	-1.5026	-4.6185	6.5560
320.0	2.1678	2.0767	-0.3158	3.0104	-1.0663	-4.7388	4.8111
330.0	2.0097	1.3851	-0.2016	2.4400	-0.6590	-4.2838	3.1298
340.0	1.6386	0.7771	-0.1037	1.8076	-0.3165	-3.3153	1.7052
350.0	1.1389	0.3271	-0.0354	1.1785	-0.0797	-2.0229	0.6943
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

u) ROLL ANGLE = 200°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000
10.0	1.1015	-0.3075	0.0665	1.1389	0.2900	-2.0151	-0.6558
20.0	1.5668	-0.9188	0.1902	1.7288	0.5581	-3.3488	-1.5806
30.0	1.9242	-1.3784	0.2884	2.2387	0.8050	-4.4314	-2.8777
40.0	2.0816	-1.9155	0.5939	2.8822	1.2854	-5.0538	-4.4069
50.0	2.0085	-2.5583	0.8145	3.3460	1.6555	-5.1263	-5.9870
60.0	1.7227	-3.1419	1.0162	3.7192	1.9777	-4.6494	-7.4443
70.0	1.2543	-3.5976	1.1731	3.9827	2.2153	-3.6804	-8.6137
80.0	0.6656	-3.9140	1.2820	4.1694	2.3632	-2.3459	-9.3987
90.0	-0.0003	-4.0118	1.3139	4.2192	2.3732	-0.7743	-9.6534
100.0	-0.6676	-3.9202	1.2836	4.1760	2.2760	0.8121	-9.3967
110.0	-1.2661	-3.6368	1.1848	4.0193	2.0584	2.3003	-8.6395
120.0	-1.7301	-3.1557	1.0203	3.7353	1.7435	3.4611	-7.4621
130.0	-2.0187	-2.5732	0.8191	3.3645	1.3699	4.1748	-5.9962
140.0	-2.0903	-1.9243	0.5973	2.8948	0.9711	4.3582	-4.4073
150.0	-1.9332	-1.2823	0.3804	2.3417	0.5947	3.9901	-2.8779
160.0	-1.5775	-0.7226	0.1953	1.7375	0.2828	3.1239	-1.5805
170.0	-1.1069	-0.3088	0.0661	1.1443	0.0668	1.9406	-0.6559
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1013	0.3105	-0.0667	1.1392	-0.2883	2.0159	0.6563
200.0	-1.5904	0.7272	-0.1963	1.7418	-0.5565	3.3492	1.5816
210.0	-1.9306	1.2847	-0.3796	2.3406	-0.8989	4.4315	2.8802
220.0	-2.0896	1.9284	-0.5980	2.8970	-1.2799	5.0550	4.4105
230.0	-2.0193	2.5806	-0.8221	3.3718	-1.6523	5.1268	5.9918
240.0	-1.7317	3.1684	-1.0251	3.7479	-1.9758	4.6503	7.4519
250.0	-1.2621	3.6349	-1.1859	4.0224	-2.2184	3.6810	8.6257
260.0	-0.6706	3.9437	-1.2929	4.2014	-2.3680	2.3498	9.4035
270.0	-0.0005	4.0132	-1.3149	4.2308	-2.3718	0.7753	9.6601
280.0	0.6697	3.9400	-1.2922	4.1975	-2.2832	-0.8293	9.4046
290.0	1.2728	3.6498	-1.1918	4.0412	-2.0668	-2.2986	8.6433
300.0	1.7456	3.1839	-1.0310	3.7692	-1.7566	-3.4591	7.4656
310.0	2.0261	2.5628	-0.8240	3.3774	-1.3786	-4.1740	5.9984
320.0	2.0869	1.9220	-0.5967	2.8907	-0.9784	-4.3585	4.4089
330.0	1.9395	1.2874	-0.3818	2.3498	-0.6043	-3.9899	2.8790
340.0	1.5825	0.7259	-0.1961	1.7433	-0.2908	-3.1254	1.5809
350.0	1.1072	0.3096	-0.0672	1.1449	-0.0718	-1.9347	0.6558
360.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

v) ROLL ANGLE = 210°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	1.0590	-0.2819	0.0935	1.0958	0.2726	-1.9253	-0.5977
20.0	1.4873	-0.6425	0.2693	1.6339	0.5076	-3.1644	-1.3924
30.0	1.8050	-1.1221	0.5187	2.1787	0.8065	-4.2012	-2.4993
40.0	1.9423	-1.6694	0.8103	2.6776	1.1328	-4.8272	-3.8014
50.0	1.8775	-2.2284	1.1132	3.1115	1.4506	-4.9497	-5.1463
60.0	1.6057	-2.7256	1.3838	3.4462	1.7223	-4.5539	-6.3810
70.0	1.1690	-3.1167	1.5965	3.6862	1.9228	-3.6985	-7.3761
80.0	0.6168	-3.3884	1.7446	3.8563	2.0466	-2.4944	-8.0409
90.0	-0.0004	-3.4585	1.7807	3.8855	2.0428	-1.0469	-8.2504
100.0	-0.6212	-3.3973	1.7491	3.8665	1.9654	0.4375	-8.0391
110.0	-1.1820	-3.1499	1.6139	3.7260	1.7758	1.8209	-7.3973
120.0	-1.6201	-2.7504	1.3959	3.4773	1.5066	2.9332	-6.3976
130.0	-1.8884	-2.2433	1.1203	3.1311	1.1805	3.6474	-5.1519
140.0	-1.9619	-1.6867	0.8204	2.7055	0.8369	3.8776	-3.8017
150.0	-1.8178	-1.1302	0.5228	2.1944	0.5114	3.5983	-2.4995
160.0	-1.4914	-0.6445	0.2702	1.6385	0.2421	2.8554	-1.5924
170.0	-1.0646	-0.2825	0.0930	1.0990	0.0544	1.8207	-0.5978
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0677	0.2858	-0.0943	1.1027	-0.2721	1.9263	0.5982
200.0	-1.4992	0.6500	-0.2723	1.6479	-0.5054	3.1654	1.3934
210.0	-1.8159	1.1329	-0.5225	2.1958	-0.8018	4.2022	2.5022
220.0	-1.9613	1.6905	-0.8213	2.7074	-1.1307	4.8307	3.8057
230.0	-1.8921	2.2533	-1.1274	3.1429	-1.4485	4.9494	5.1500
240.0	-1.6278	2.7710	-1.4093	3.5024	-1.7282	4.5609	6.3908
250.0	-1.1840	3.1687	-1.6259	3.7475	-1.9320	3.7051	7.3875
260.0	-0.6269	3.4362	-1.7705	3.9078	-2.0564	2.5027	8.0476
270.0	-0.0006	3.4619	-1.7817	3.8869	-2.0428	1.0481	8.2500
280.0	0.6249	3.4215	-1.7649	3.8956	-1.9747	-0.4323	8.0485
290.0	1.1924	3.1765	-1.6308	3.7591	-1.7873	-1.8164	7.4032
300.0	1.6354	2.7760	-1.4125	3.5115	-1.5160	-2.9503	6.4629
310.0	1.8973	2.2541	-1.1265	3.1471	-1.1896	-3.6463	5.1560
320.0	1.9594	1.6852	-0.8195	2.7024	-0.8432	-3.8783	3.8042
330.0	1.8152	1.1294	-0.5225	2.1916	-0.5183	-3.5978	2.5007
340.0	1.4930	0.6465	-0.2704	1.6407	-0.2483	-2.8552	1.3930
350.0	1.0654	0.2835	-0.0940	1.0980	-0.0595	-1.8196	0.5979
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

w) ROLL ANGLE = 220°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	1.0088	-0.2496	0.1141	1.0394	0.2504	-1.7981	-0.5250
20.0	1.3810	-0.5171	0.2812	1.5116	0.4436	-2.8898	-1.1611
30.0	1.6550	-0.9752	0.6103	1.9884	0.6835	-3.8302	-2.0350
40.0	1.7723	-1.3779	0.9505	2.4288	0.9459	-4.4246	-3.0605
50.0	1.7117	-1.6501	1.3036	2.8161	1.1985	-4.6749	-4.1144
60.0	1.4567	-1.8231	1.6122	3.1006	1.4084	-4.2631	-5.0863
70.0	1.0577	-1.8308	1.8534	3.3031	1.5607	-3.5303	-5.8620
80.0	0.5584	-1.7442	2.0209	3.4464	1.6555	-2.4859	-6.3818
90.0	-0.0004	-1.7878	2.0529	3.4552	1.6390	-1.2004	-6.5418
100.0	-0.5591	-1.7435	2.0191	3.4448	1.5763	0.1185	-6.3813
110.0	-1.0451	-1.5483	1.8658	3.3256	1.4231	1.3653	-5.8784
120.0	-1.4627	-1.2341	1.6176	3.1139	1.2075	2.3860	-5.0972
130.0	-1.7123	-0.8330	1.2948	2.8187	0.9469	3.0648	-4.1215
140.0	-1.7860	-0.3888	0.9602	2.4487	0.6698	3.3211	-3.0608
150.0	-1.6606	-0.0394	0.6139	1.9951	0.4078	3.1277	-2.0758
160.0	-1.3778	-0.5462	0.3205	1.5083	0.1915	2.5243	-1.1611
170.0	-1.0166	-0.2503	0.1146	1.0473	0.0390	1.6709	-0.5250
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0155	0.2520	-0.1155	1.0765	-0.2502	1.7996	0.5254
200.0	-1.3908	0.5529	-0.3247	1.5232	-0.4409	2.6911	1.1627
210.0	-1.6623	0.9431	-0.6151	1.9985	-0.6791	3.6342	2.0389
220.0	-1.7907	1.3953	-0.9667	2.4573	-0.9430	4.4301	3.0652
230.0	-1.7291	1.8831	-1.3228	2.8502	-1.1988	4.5877	4.1275
240.0	-1.4731	2.2539	-1.6382	3.1438	-1.4114	4.2694	5.0944
250.0	-1.0685	2.5667	-1.8834	3.3506	-1.5657	3.5570	5.8727
260.0	-0.5650	2.7772	-2.0499	3.4908	-1.6601	2.4924	6.3902
270.0	-0.0005	2.7917	-2.0564	3.4610	-1.6387	1.2018	6.5508
280.0	0.5632	2.7684	-2.0416	3.4706	-1.5871	-0.1101	6.3925
290.0	1.0751	2.5717	-1.8861	3.3581	-1.4346	-1.3593	5.8862
300.0	1.4767	2.2540	-1.6368	3.1448	-1.2177	-2.3825	5.1042
310.0	1.7156	1.8373	-1.3094	2.8256	-0.9541	-3.0849	4.1268
320.0	1.7760	1.3883	-0.9540	2.4353	-0.6754	-3.3226	3.0642
330.0	1.6529	0.9388	-0.6603	1.9861	-0.4148	-3.1281	2.0380
340.0	1.3812	0.5488	-0.3216	1.5124	-0.1977	-2.5238	1.1620
350.0	1.0143	0.2511	-0.1149	1.0451	-0.0440	-1.6702	0.5253
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

x) ROLL ANGLE = 230°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000
10.0	0.9559	-0.2132	0.1293	0.9824	0.2252	-1.6431	-0.4437
20.0	1.2514	-0.4402	0.3468	1.3635	0.3711	-2.5369	-0.9101
30.0	1.4778	-0.7315	0.6510	1.7642	0.5483	-3.3352	-1.5374
40.0	1.5603	-1.0551	0.9968	2.1220	0.7364	-3.8562	-2.2661
50.0	1.4906	-1.3799	1.3513	2.4335	0.9170	-4.0143	-3.0203
60.0	1.2717	-1.6732	1.6745	2.6781	1.0673	-3.7774	-3.7065
70.0	0.9193	-1.8932	1.9169	2.8377	1.1694	-3.1751	-4.2511
80.0	0.4803	-2.0330	2.0688	2.9310	1.2234	-2.2977	-4.6135
90.0	-0.0005	-2.0601	2.0976	2.9310	1.2039	-1.2172	-4.7237
100.0	-0.4812	-2.0327	2.0686	2.9308	1.1568	-0.1071	-4.6164
110.0	-0.9198	-1.8951	1.9178	2.8397	1.0428	0.9582	-4.2624
120.0	-1.2652	-1.6672	1.6650	2.6652	0.8857	1.8756	-3.7113
130.0	-1.4884	-1.3800	1.3492	2.4260	0.6954	2.4522	-3.0196
140.0	-1.5689	-1.0617	1.0040	2.1349	0.4899	2.7117	-2.2676
150.0	-1.4764	-0.7315	0.6510	1.7630	0.2971	2.5965	-1.5373
160.0	-1.2408	-0.4371	0.3453	1.3520	0.1363	2.1476	-0.9099
170.0	-0.9501	-0.2120	0.1269	0.9762	0.0213	1.5006	-0.4437
180.0	-0.9229	-0.0004	-0.0005	0.9229	-0.1001	1.4732	0.0000
190.0	-0.9530	0.2138	-0.1289	0.9796	-0.2243	1.6437	0.4441
200.0	-1.2584	0.4440	-0.3504	1.3719	-0.3688	2.3382	0.9114
210.0	-1.4798	0.7353	-0.6558	1.7683	-0.5443	3.3359	1.5400
220.0	-1.5740	1.0671	-1.0095	2.1437	-0.7352	3.8613	2.2721
230.0	-1.5158	1.4054	-1.3810	2.4768	-0.9183	4.0223	3.0260
240.0	-1.2855	1.6952	-1.7007	2.7147	-1.0671	3.7822	3.7141
250.0	-0.9296	1.9201	-1.9501	2.8914	-1.1718	3.1816	4.2614
260.0	-0.4839	2.0565	-2.0994	2.9696	-1.2243	2.2996	4.6175
270.0	-0.0006	2.0751	-2.1203	2.9581	-1.2067	1.2235	4.7312
280.0	0.4858	2.0561	-2.0974	2.9681	-1.1656	0.1161	4.6271
290.0	0.9311	1.9185	-1.9455	2.8777	-1.0554	-0.9500	4.2699
300.0	1.2818	1.6893	-1.6911	2.7051	-0.9056	-1.8598	3.7190
310.0	1.4930	1.3870	-1.3562	2.4365	-0.7021	-2.4497	3.0255
320.0	1.5637	1.0601	-1.0006	2.1285	-0.4965	-2.7126	2.2718
330.0	1.4707	0.7301	-0.6477	1.7564	-0.3032	-2.5966	1.5396
340.0	1.2359	0.4383	-0.3428	1.3475	-0.1420	-2.1468	0.9109
350.0	0.9441	0.2135	-0.1273	0.9704	-0.0262	-1.4984	0.4439
360.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

y) ROLL ANGLE = 240°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000
10.0	0.8814	-0.1723	0.1343	0.9032	0.1971	-1.4672	-0.3601
20.0	1.0856	-0.3298	0.2598	1.1788	0.2951	-2.1275	-0.6637
30.0	1.2480	-0.5178	0.4203	1.4786	0.4100	-2.7317	-1.0578
40.0	1.3056	-0.7306	0.9422	1.7594	0.5282	-3.1402	-1.5100
50.0	1.2366	-0.9401	1.2674	1.9957	0.6389	-3.2735	-1.9726
60.0	1.0470	-1.1247	1.5573	2.1785	0.7283	-3.1024	-2.3947
70.0	0.7476	-1.2552	1.7618	2.2788	0.7821	-2.6338	-2.7273
80.0	0.3857	-1.3310	1.8766	2.3228	0.8019	-1.9369	-2.9408
90.0	-0.0005	-1.3511	1.9064	2.3265	0.7868	-1.0985	-3.0126
100.0	-0.3854	-1.3274	1.8684	2.3183	0.7485	-0.2223	-2.9478
110.0	-0.7455	-1.2516	1.7530	2.2696	0.6758	0.6166	-2.7332
120.0	-1.0390	-1.1177	1.5419	2.1598	0.5732	1.3277	-2.3959
130.0	-1.2290	-0.9347	1.2579	1.9825	0.4468	1.8358	-1.9730
140.0	-1.2946	-0.7255	0.9350	1.7454	0.3126	2.0772	-1.5097
150.0	-1.2463	-0.5175	0.6198	1.4778	0.1875	2.0341	-1.0577
160.0	-1.0871	-0.3201	0.3394	1.1778	0.0818	1.7476	-0.6636
170.0	-0.8745	-0.1714	0.1323	0.8960	0.0025	1.3204	-0.3601
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8873	0.1738	-0.1358	0.9093	-0.1971	1.4689	0.3603
200.0	-1.1079	0.3322	-0.3486	1.2011	-0.2947	2.1305	0.6646
210.0	-1.2656	0.5263	-0.6312	1.5009	-0.4049	2.7352	1.0598
220.0	-1.3274	0.7437	-0.9613	1.7909	-0.5293	3.1473	1.5127
230.0	-1.2528	0.9582	-1.2871	2.0286	-0.6393	3.2792	1.9763
240.0	-1.0635	1.1435	-1.5871	2.2172	-0.7297	3.1094	2.4000
250.0	-0.7586	1.2750	-1.7954	2.3196	-0.7848	2.6408	2.7333
260.0	-0.3865	1.3460	-1.9037	2.3535	-0.8017	1.9356	2.9433
270.0	-0.0008	1.3646	-1.9372	2.3549	-0.7894	1.1071	3.0147
280.0	0.3927	1.3542	-1.9157	2.3688	-0.7587	0.2390	2.9548
290.0	0.7581	1.2725	-1.7880	2.3122	-0.6846	-0.6048	2.7382
300.0	1.0564	1.1355	-1.5712	2.1962	-0.5821	-1.3196	2.4019
310.0	1.2465	0.9487	-1.2779	2.0123	-0.4549	-1.8265	1.9767
320.0	1.3063	0.7336	-0.9434	1.7616	-0.3204	-2.0732	1.5129
330.0	1.2363	0.5164	-0.6142	1.4657	-0.1923	-2.0338	1.0596
340.0	1.0711	0.3248	-0.3354	1.1613	-0.0857	-1.7458	0.6642
350.0	0.8043	0.1737	-0.1343	0.9062	-0.0068	-1.3163	0.3603
360.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

z) ROLL ANGLE = 250°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000
10.0	0.8226	-0.1351	0.1357	0.8401	0.1708	-1.2864	-0.2796
20.0	0.9318	-0.2224	0.3162	1.0032	0.2245	-1.6997	-0.4436
30.0	1.0261	-0.3288	0.5489	1.1975	0.2853	-2.0751	-0.6436
40.0	1.0435	-0.4460	0.8158	1.3901	0.3440	-2.5288	-0.8656
50.0	0.9546	-0.5499	1.0584	1.5199	0.3941	-2.5994	-1.0906
60.0	0.7936	-0.6428	1.2771	1.6265	0.4294	-2.2681	-1.2940
70.0	0.5647	-0.7115	1.4393	1.6927	0.4498	-1.9818	-1.4543
80.0	0.2568	-0.7413	1.5050	1.6904	0.4470	-1.4391	-1.5505
90.0	-0.0002	-0.7508	1.5252	1.6861	0.4518	-0.8576	-1.5651
100.0	-0.2824	-0.7302	1.4708	1.6561	0.4022	-0.2409	-1.5522
110.0	-0.5598	-0.7047	1.4157	1.6446	0.3604	0.3321	-1.4552
120.0	-0.7871	-0.6379	1.2557	1.6044	0.3081	0.8455	-1.2984
130.0	-0.9492	-0.5464	1.0441	1.5049	0.2376	1.2246	-1.0907
140.0	-1.0166	-0.4370	0.7932	1.3539	0.1652	1.4536	-0.8654
150.0	-1.0200	-0.3300	0.5492	1.1978	0.0956	1.4432	-0.6432
160.0	-0.9390	-0.2250	0.3180	1.0107	0.0323	1.3504	-0.4432
170.0	-0.8094	-0.1320	0.1334	0.8207	-0.0152	1.1594	-0.2767
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8196	0.1331	-0.1362	0.8373	-0.1698	1.2872	0.2798
200.0	-0.9547	0.2267	-0.3259	1.0284	-0.2249	1.7053	0.4440
210.0	-1.0425	0.3359	-0.5046	1.2256	-0.2847	2.0784	0.6447
220.0	-1.0548	0.4521	-0.8276	1.4073	-0.3432	2.3328	0.8677
230.0	-0.9764	0.5428	-1.0864	1.5571	-0.3942	2.4081	1.0929
240.0	-0.8124	0.6570	-1.3118	1.6883	-0.4313	2.2765	1.2969
250.0	-0.5755	0.7257	-1.4729	1.7300	-0.4515	1.9510	1.4588
260.0	-0.2863	0.7463	-1.5245	1.7119	-0.4449	1.4384	1.5516
270.0	-0.0001	0.7547	-1.5492	1.7136	-0.4315	0.8849	1.5833
280.0	0.2901	0.7499	-1.5332	1.7218	-0.4101	0.2661	1.5553
290.0	0.5593	0.7103	-1.4335	1.6854	-0.3716	-0.3203	1.4598
300.0	0.8009	0.6491	-1.2885	1.6412	-0.3140	-0.8353	1.2994
310.0	0.9626	0.5554	-1.0660	1.5330	-0.2438	-1.2180	1.0948
320.0	1.0166	0.4405	-0.7954	1.3560	-0.1687	-1.4320	0.8685
330.0	1.0040	0.3284	-0.5413	1.1800	-0.0976	-1.4674	0.6451
340.0	0.9182	0.2225	-0.3119	0.9441	-0.0361	-1.3498	0.4441
350.0	0.8271	0.1340	-0.1360	0.8406	0.0124	-1.1591	0.2801
360.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

aa) ROLL ANGLE = 260°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000
10.0	0.7643	-0.0950	0.1320	0.7701	0.1446	-1.1104	-0.2070
20.0	0.7870	-0.1323	0.2708	0.8413	0.1630	-1.2947	-0.2646
30.0	0.8153	-0.1759	0.4592	0.9478	0.1821	-1.4445	-0.3203
40.0	0.7878	-0.2192	0.6435	1.0352	0.1964	-1.5245	-0.3955
50.0	0.6889	-0.2545	0.7973	1.0761	0.2040	-1.5061	-0.4620
60.0	0.5544	-0.2848	0.9297	1.1129	0.2050	-1.3906	-0.5212
70.0	0.3845	-0.3083	1.0217	1.1278	0.2027	-1.1824	-0.5688
80.0	0.1866	-0.3125	1.0244	1.0797	0.1899	-0.8708	-0.5962
90.0	-0.0002	-0.3129	1.0245	1.0632	0.1763	-0.5426	-0.5974
100.0	-0.1806	-0.3029	0.9710	1.0249	0.1593	-0.1991	-0.5954
110.0	-0.3789	-0.3026	0.9933	1.0982	0.1440	0.1019	-0.5684
120.0	-0.5370	-0.2779	0.8872	1.0670	0.1161	0.4154	-0.5224
130.0	-0.6842	-0.2520	0.7804	1.0620	0.0847	0.6648	-0.4620
140.0	-0.7589	-0.2140	0.6179	0.9964	0.0517	0.8459	-0.3954
150.0	-0.8051	-0.1741	0.4534	0.9356	0.0196	0.9556	-0.3282
160.0	-0.7897	-0.1322	0.2799	0.8443	-0.0093	0.9954	-0.2642
170.0	-0.7506	-0.0947	0.1296	0.7643	-0.0330	0.9649	-0.2069
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.7537	0.0949	-0.1308	0.7675	-0.1439	1.1106	0.2070
200.0	-0.8114	0.1349	-0.2895	0.8660	-0.1641	1.3000	0.2646
210.0	-0.8329	0.1700	-0.4325	0.9095	-0.1843	1.4496	0.3287
220.0	-0.7844	0.2207	-0.6431	1.0326	-0.1950	1.5255	0.3970
230.0	-0.6927	0.2577	-0.8041	1.0861	-0.2026	1.5098	0.4637
240.0	-0.5559	0.2870	-0.9345	1.1161	-0.2044	1.3929	0.5236
250.0	-0.3846	0.3088	-1.0246	1.1249	-0.2014	1.1822	0.5716
260.0	-0.1819	0.3060	-1.0123	1.0657	-0.1850	0.8615	0.5956
270.0	0.0002	0.3023	-1.0144	1.0515	-0.1716	0.5402	0.5871
280.0	0.1798	0.3037	-1.0037	1.0566	-0.1602	0.2199	0.5929
290.0	0.3707	0.3025	-0.9912	1.0934	-0.1464	-0.0454	0.5721
300.0	0.5435	0.2857	-0.9128	1.0929	-0.1206	-0.4056	0.5259
310.0	0.6811	0.2545	-0.7887	1.0666	-0.0884	-0.6549	0.4648
320.0	0.7531	0.2143	-0.6175	0.9917	-0.0544	-0.8446	0.3972
330.0	0.7902	0.1743	-0.4468	0.9194	-0.0268	-0.9566	0.3298
340.0	0.7852	0.1352	-0.2782	0.8576	-0.0063	-0.9928	0.2650
350.0	0.7510	0.0958	-0.1295	0.7646	0.0045	-0.9694	0.2074
360.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

bb) ROLL ANGLE = 270°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	0.9049	-0.0005	0.1581	0.9186	0.0983	-1.5332	0.0164
20.0	0.8728	0.0004	0.3150	0.9279	0.0907	-1.5398	0.0309
30.0	0.8211	0.0001	0.4691	0.9456	0.0809	-1.4979	0.0434
40.0	0.7478	-0.0003	0.6189	0.9706	0.0683	-1.4125	0.0550
50.0	0.6098	-0.0001	0.7147	0.9394	0.0528	-1.2740	0.0576
60.0	0.4688	0.0001	0.7960	0.9237	0.0373	-1.0950	0.0562
70.0	0.3118	-0.0005	0.8358	0.8916	0.0250	-0.8869	0.0547
80.0	0.1508	-0.0008	0.8219	0.8356	0.0091	-0.6458	0.0411
90.0	-0.0006	-0.0008	0.8689	0.8689	0.0000	-0.4484	0.0500
100.0	-0.1498	-0.0003	0.8111	0.8248	-0.0108	-0.1951	0.0504
110.0	-0.3063	-0.0001	0.8095	0.8654	-0.0223	0.0291	0.0536
120.0	-0.4441	0.0002	0.7592	0.8622	-0.0356	0.2769	0.0550
130.0	-0.6154	0.0001	0.7113	0.9404	-0.0512	0.5224	0.0558
140.0	-0.7027	-0.0003	0.5806	0.9115	-0.0672	0.7659	0.0523
150.0	-0.8141	-0.0002	0.4660	0.9360	-0.0806	0.9932	0.0434
160.0	-0.8710	0.0004	0.3158	0.9258	-0.0910	1.1955	0.0310
170.0	-0.8968	-0.0001	0.1569	0.9104	-0.0978	1.3588	0.0162
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.9100	0.0001	-0.1605	0.9241	-0.0986	1.5347	-0.0164
200.0	-0.8865	0.0003	-0.3217	0.9450	-0.0917	1.5422	-0.0313
210.0	-0.8416	0.0005	-0.4839	0.9708	-0.0818	1.5041	-0.0443
220.0	-0.7366	0.0007	-0.6128	0.9562	-0.0678	1.4120	-0.0529
230.0	-0.6170	0.0007	-0.7261	0.9528	-0.0528	1.2754	-0.0579
240.0	-0.4623	0.0002	-0.7858	0.9117	-0.0369	1.0894	-0.0577
250.0	-0.3059	-0.0003	-0.8243	0.8791	-0.0225	0.8696	-0.0547
260.0	-0.1350	-0.0004	-0.7544	0.7664	-0.0072	0.5925	-0.0377
270.0	-0.0006	-0.0008	-0.6478	0.6478	0.0000	0.3502	-0.0354
280.0	0.1159	-0.0015	-0.6409	0.6512	0.0068	0.1422	-0.0386
290.0	0.2978	-0.0012	-0.8043	0.8576	0.0220	-0.0230	-0.0521
300.0	0.4562	-0.0011	-0.7777	0.9016	0.0350	-0.2656	-0.0548
310.0	0.6045	-0.0006	-0.7157	0.9401	0.0516	-0.5157	-0.0562
320.0	0.7212	-0.0004	-0.5999	0.9381	0.0672	-0.7599	-0.0522
330.0	0.8104	0.0001	-0.4651	0.9344	0.0793	-0.9935	-0.0428
340.0	0.8691	-0.0001	-0.5153	0.9258	0.0898	-1.1961	-0.0306
350.0	0.9083	0.0000	-0.1592	0.9221	0.0966	-1.3584	-0.0159
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

cc) ROLL ANGLE = 280°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000
10.0	0.7653	0.0958	0.1319	0.7791	0.0305	-1.1099	0.2353
20.0	0.7976	0.1349	0.2826	0.8227	-0.0062	-1.2952	0.3218
30.0	0.8150	0.1772	0.4587	0.9470	-0.0226	-1.4433	0.4130
40.0	0.7930	0.2207	0.6476	1.0421	-0.0551	-1.5252	0.5044
50.0	0.6975	0.2580	0.8075	1.0918	-0.0601	-1.5090	0.5867
60.0	0.5618	0.2890	0.9426	1.1083	-0.1207	-1.3941	0.6545
70.0	0.3893	0.3118	1.0351	1.1418	-0.1482	-1.1860	0.7035
80.0	0.1901	0.3149	1.0382	1.0937	-0.1678	-0.8725	0.7072
90.0	0.0062	0.3112	1.0157	1.0543	-0.1753	-0.5360	0.7039
100.0	-0.1808	0.3086	1.0037	1.0576	-0.1841	-0.2195	0.7072
110.0	-0.3413	0.3067	1.0143	1.1191	-0.1984	0.0981	0.6967
120.0	-0.5434	0.2832	0.9034	1.0847	-0.2027	0.4041	0.6537
130.0	-0.6949	0.2567	0.7984	1.0832	-0.2022	0.6578	0.5877
140.0	-0.7688	0.2178	0.6287	1.0112	-0.1935	0.8430	0.5039
150.0	-0.8055	0.1753	0.4551	0.8368	-0.1792	0.9558	0.4129
160.0	-0.7940	0.1340	0.2825	0.8492	-0.1624	0.9954	0.3217
170.0	-0.7420	0.0940	0.1279	0.7554	-0.1428	0.9701	0.2354
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.7543	-0.0951	-0.1317	0.7683	-0.0330	1.1107	-0.2359
200.0	-0.8020	-0.1340	-0.2861	0.8580	-0.0090	1.2987	-0.3226
210.0	-0.8216	-0.1772	-0.4657	0.9562	0.0204	1.4479	-0.4140
220.0	-0.7774	-0.2175	-0.6382	1.0238	0.0532	1.5237	-0.5060
230.0	-0.6877	-0.2562	-0.7989	1.0786	0.0874	1.5077	-0.5885
240.0	-0.5510	-0.2860	-0.9261	1.1084	0.1194	1.3914	-0.6564
250.0	-0.3834	-0.3096	-1.0240	1.1292	0.1469	1.1824	-0.7064
260.0	-0.1849	-0.3085	-1.0219	1.0759	0.1658	0.8692	-0.7032
270.0	-0.0006	-0.3016	-1.0148	1.0517	0.1699	0.5347	-0.6856
280.0	0.1850	-0.3001	-1.0085	1.0615	0.1784	0.2202	-0.6835
290.0	0.3870	-0.3053	-1.0304	1.1264	0.2002	-0.0859	-0.6946
300.0	0.5506	-0.2855	-0.9235	1.1058	0.2045	-0.3969	-0.6540
310.0	0.6894	-0.2567	-0.7913	1.0788	0.2038	-0.6549	-0.5884
320.0	0.7614	-0.2163	-0.6233	1.0020	0.1943	-0.8435	-0.5044
330.0	0.8019	-0.1753	-0.4525	0.9325	0.1805	-0.9564	-0.4135
340.0	0.7908	-0.1334	-0.2811	0.8457	0.1630	-0.9934	-0.3217
350.0	0.7497	-0.0948	-0.1292	0.7632	0.1436	-0.9698	-0.2354
360.0	0.9375	-0.0003	0.0003	0.9375	0.1001	-1.4728	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

dd) ROLL ANGLE = 290°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000
10.0	0.8312	-0.1347	-0.1367	0.8488	-0.0145	-1.2860	-0.3081
20.0	0.9415	0.2258	0.3191	1.0137	-0.0365	-1.6986	0.5041
30.0	1.0309	0.3333	0.5548	1.2105	-0.0984	-2.0739	0.7392
40.0	1.0521	0.4498	0.8224	1.4016	-0.1699	-2.3297	0.9957
50.0	0.9785	0.5616	1.0865	1.3582	-0.2452	-2.4077	1.2446
60.0	0.8115	0.6549	1.3071	1.6635	-0.3158	-2.2758	1.4729
70.0	0.5718	0.7200	1.4623	1.7181	-0.3741	-1.9342	1.6371
80.0	0.2877	0.7482	1.5252	1.7134	-0.4140	-1.4365	1.7184
90.0	0.0003	0.7520	1.5325	1.6472	-0.4305	-0.8559	1.7513
100.0	-0.2810	0.7364	1.4924	1.6779	-0.4382	-0.2549	1.7183
110.0	-0.5490	0.7040	1.4194	1.6674	-0.4349	0.3083	1.6122
120.0	-0.7676	0.6322	1.2811	1.5810	-0.4144	0.8199	1.4472
130.0	-0.9533	0.5509	1.0590	1.5193	-0.3879	1.2049	1.2427
140.0	-1.0423	0.4467	0.8176	1.3905	-0.3421	1.4264	0.9968
150.0	-1.0296	0.3336	0.5566	1.2102	-0.2824	1.4655	0.7396
160.0	-0.9425	0.2256	0.3208	1.0152	-0.2254	1.3508	0.5046
170.0	-0.8070	0.1318	0.1330	0.8243	-0.1687	1.1399	0.3083
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8197	-0.1332	-0.1364	0.8374	-0.0156	1.2871	-0.3088
200.0	-0.9440	-0.2239	-0.3217	1.0167	0.0551	1.7024	-0.5057
210.0	-1.0351	-0.3337	-0.5607	1.2169	0.0954	1.9774	-0.7418
220.0	-1.0415	-0.4466	-0.8176	1.3898	0.1669	2.3301	-0.9986
230.0	-0.9638	-0.5560	-1.0727	1.5373	0.2418	2.4086	-1.2527
240.0	-0.8018	-0.6497	-1.2938	1.6462	0.3125	2.2757	-1.4770
250.0	-0.5681	-0.7149	-1.4536	1.7076	0.3708	1.9407	-1.6403
260.0	-0.2864	-0.7390	-1.5116	1.6975	0.4099	1.4366	-1.7124
270.0	-0.0005	-0.7442	-1.5237	1.6964	0.4273	0.8560	-1.7524
280.0	0.2871	-0.7361	-1.5077	1.6930	0.4403	0.2609	-1.7153
290.0	0.5545	-0.6949	-1.4130	1.6607	0.4335	-0.3184	-1.6028
300.0	0.7782	-0.6287	-1.2526	1.5946	0.4148	-0.8227	-1.4410
310.0	0.9601	-0.5516	-1.0649	1.5282	0.3902	-1.2067	-1.2424
320.0	1.0364	-0.4446	-0.8104	1.3811	0.3437	-1.4278	-0.9977
330.0	1.0213	-0.3306	-0.5507	1.1997	0.2845	-1.4665	-0.7406
340.0	0.9321	-0.2230	-0.3168	1.0058	0.2259	-1.3511	-0.5047
350.0	0.8154	-0.1324	-0.1342	0.8328	0.1690	-1.1395	-0.3062
360.0	0.9349	-0.0002	0.0003	0.9349	0.1000	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

ee) ROLL ANGLE = 300°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	0.8968	0.1759	0.1363	0.9209	-0.0068	-1.4679	0.3676
20.0	1.1056	0.3320	0.3458	1.1961	-0.0872	-2.1280	0.7260
30.0	1.2585	0.5235	0.6248	1.4913	-0.1945	-3.7318	1.1607
40.0	1.3270	0.7422	0.9580	1.7884	-0.3225	-3.1452	1.6550
50.0	1.2582	0.9552	1.2898	2.0343	-0.4572	-3.2802	2.1558
60.0	1.0613	1.1387	1.5790	2.2079	-0.5830	-3.1088	2.6084
70.0	0.7507	1.2663	1.7790	2.2994	-0.6872	-2.6225	2.9384
80.0	0.3906	1.3513	1.9126	2.3643	-0.7604	-1.9445	3.1666
90.0	0.0000	1.3601	1.9252	2.3473	-0.7871	-1.0946	3.2333
100.0	-0.3861	1.3397	1.8912	2.3396	-0.8001	-0.2346	3.1674
110.0	-0.7425	1.2572	1.7635	2.2798	-0.7728	0.5954	2.9359
120.0	-1.0127	1.1041	1.5160	2.1214	-0.7038	1.3006	2.5685
130.0	-1.2218	0.9346	1.2555	1.9702	-0.6289	1.8124	2.1411
140.0	-1.3153	0.7364	0.9520	1.7742	-0.5284	2.0697	1.6566
150.0	-1.2607	0.5248	0.6287	1.6952	-0.4079	2.0308	1.1617
160.0	-1.0953	0.3300	0.3454	1.1873	-0.2954	1.7464	0.7265
170.0	-0.8762	0.1724	0.1329	0.8979	-0.1902	1.3200	0.3878
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.8857	-0.1733	-0.1357	0.9077	0.0030	1.4686	-0.3843
200.0	-1.0978	-0.3289	-0.3459	1.1903	0.0851	2.1267	-0.7275
210.0	-1.2652	-0.5242	-0.6322	1.5006	0.1905	2.7345	-1.1637
220.0	-1.3191	-0.7386	-0.9562	1.7802	0.3178	3.1456	-1.6589
230.0	-1.2473	-0.9888	-1.2820	2.0156	0.4516	3.2776	-2.1605
240.0	-1.0581	-1.1372	-1.5781	2.2050	0.5790	3.1071	-2.6134
250.0	-0.7567	-1.2680	-1.7865	2.3084	0.6851	2.6381	-2.9536
260.0	-0.3950	-1.3495	-1.9134	2.3646	0.7574	1.9502	-3.1715
270.0	-0.0005	-1.3565	-1.9141	2.3334	0.7841	1.0980	-3.2341
280.0	0.3893	-1.3410	-1.8968	2.3455	0.8043	0.2367	-3.1737
290.0	0.7461	-1.2514	-1.7587	2.2743	0.7754	-0.6027	-2.9374
300.0	1.0285	-1.1038	-1.5304	2.1400	0.7070	-1.3060	-2.5658
310.0	1.2254	-0.9319	-1.2564	1.9761	0.6307	-1.8164	-2.1401
320.0	1.3147	-0.7352	-0.9500	1.7722	0.5304	-2.0692	-1.6568
330.0	1.2532	-0.5205	-0.6230	1.6851	0.4102	-2.0322	-1.1527
340.0	1.0878	-0.3269	-0.3410	1.1791	0.2944	-1.7471	-0.7266
350.0	0.8849	-0.1730	-0.1347	0.9067	0.1969	-1.3196	-0.3877
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

ff) ROLL ANGLE = 310°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000
10.0	0.9600	0.2157	0.1292	0.9867	-0.0262	-1.6469	0.4642
20.0	1.2608	0.4445	0.3498	1.3741	-0.1432	-2.5370	0.9706
30.0	1.4789	0.7332	0.6504	1.7655	-0.3039	-3.3334	1.6405
40.0	1.5611	1.0574	0.9972	2.1237	-0.4970	-3.8564	2.4162
50.0	1.5126	1.3998	1.3747	2.4682	-0.7033	-4.0216	3.2136
60.0	1.2913	1.6970	1.7025	2.7198	-0.8972	-3.7915	3.9397
70.0	0.9318	1.9182	1.9482	2.8796	-1.0566	-3.1880	4.5043
80.0	0.4866	2.0582	2.1040	2.9746	-1.1698	-2.3094	4.8774
90.0	-0.0004	2.0715	2.1159	2.9524	-1.2078	-1.2222	4.9846
100.0	-0.4845	2.0500	2.0929	2.9607	-1.2264	-0.1172	4.8767
110.0	-0.9243	1.9075	1.9550	2.8612	-1.1713	0.9467	4.5072
120.0	-1.2579	1.6634	1.6611	2.6569	-1.0569	1.8564	3.9260
130.0	-1.4840	1.3612	1.3512	2.4269	-0.9067	2.4372	3.1445
140.0	-1.5677	1.0627	1.0050	2.1348	-0.7346	2.7106	2.4188
150.0	-1.4753	0.7330	0.6514	1.7627	-0.5439	2.5961	1.6419
160.0	-1.2486	0.4414	0.3465	1.3612	-0.3600	2.1468	0.9712
170.0	-0.9458	0.2124	0.1273	0.9720	-0.2237	1.5007	0.4645
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-0.9591	-0.2139	-0.1297	0.9857	-0.0215	1.6437	-0.4700
200.0	-1.2507	-0.4401	-0.5488	1.3655	0.1377	2.5368	-0.9722
210.0	-1.4827	-0.7345	-0.6559	1.7714	0.2992	3.3302	-1.6440
220.0	-1.5741	-1.0650	-1.0101	2.1432	0.4925	3.8609	-2.4219
230.0	-1.5050	-1.3939	-1.3690	2.4571	0.6971	4.0207	-3.2192
240.0	-1.2848	-1.6902	-1.6973	2.7093	0.8912	3.7901	-3.9463
250.0	-0.9282	-1.9089	-1.9409	2.8676	1.0501	3.1865	-4.5073
260.0	-0.4876	-2.0558	-2.1025	2.9721	1.1668	2.3117	-4.8837
270.0	-0.0006	-2.0654	-2.1106	2.9444	1.2040	1.2209	-4.9876
280.0	0.4837	-2.0445	-2.0879	2.9532	1.2262	0.1163	-4.8819
290.0	0.9246	-1.9017	-1.9300	2.8542	1.1725	-0.9483	-4.5458
300.0	1.2663	-1.6666	-1.6696	2.6685	1.0619	-1.8359	-3.9262
310.0	1.4807	-1.3717	-1.3451	2.4165	0.9099	-2.4425	-3.2010
320.0	1.5654	-1.0584	-1.0021	2.1299	0.7377	-2.7100	-2.4195
330.0	1.4755	-0.7309	-0.6508	1.7620	0.5477	-2.5955	-1.6428
340.0	1.2531	-0.4407	-0.3479	1.3656	0.3708	-2.1456	-0.9715
350.0	0.9554	-0.2133	-0.1290	0.9798	0.2244	-1.4999	-0.4644
360.0	0.9339	-0.0001	0.0003	0.9339	0.0999	-1.4730	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

gg) ROLL ANGLE = 320°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0. 0. 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000
10.0	1.0185	0.2585	0.1151	1.0494	-0.0440	-1.7983	0.5472
20.0	1.3989	0.5540	0.3259	1.5313	-0.1989	-2.8909	1.2161
30.0	1.6684	0.9442	0.6155	2.0043	-0.3164	-3.8308	2.1314
40.0	1.7945	1.3951	0.9643	2.4600	-0.6790	-4.4290	3.2012
50.0	1.7340	1.8545	1.3238	2.8547	-0.9588	-4.5884	4.3049
60.0	1.4872	2.2682	1.6474	3.1654	-1.2218	-4.2846	5.3165
70.0	1.0849	2.5915	1.9032	3.3861	-1.4408	-3.5579	6.1216
80.0	0.5669	2.7841	2.0548	3.4994	-1.5925	-2.4948	6.6413
90.0	-0.0004	2.8072	2.0678	3.4795	-1.6452	-1.2050	6.7491
100.0	-0.5671	2.7844	2.0547	3.4996	-1.6631	0.1074	6.6405
110.0	-1.0814	2.5890	1.9005	3.3818	-1.5786	1.3556	6.1246
120.0	-1.4851	2.2661	1.6462	3.1612	-1.4164	2.3607	5.3183
130.0	-1.7319	1.8562	1.3247	2.8548	-1.1941	3.0618	4.3062
140.0	-1.7885	1.3937	0.9630	2.4542	-0.9425	3.3199	3.2023
150.0	-1.6628	0.9432	0.6151	1.9989	-0.6795	3.1266	2.1324
160.0	-1.3917	0.5535	0.3250	1.5243	-0.4406	2.5257	1.2165
170.0	-1.0122	0.2518	0.1146	1.0431	-0.2497	1.6711	0.5476
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0177	-0.2517	-0.1157	1.0486	0.0389	1.7993	-0.5481
200.0	-1.3802	-0.5476	-0.3222	1.5113	0.1924	2.8907	-1.2180
210.0	-1.6554	-0.9374	-0.6120	1.9494	0.4075	3.6306	-2.1358
220.0	-1.7764	-1.3827	-0.9554	2.4363	0.6685	4.4273	-3.2067
230.0	-1.7078	-1.8292	-1.3022	2.8123	0.9459	4.5841	-4.3121
240.0	-1.4625	-2.2334	-1.6185	3.1139	1.2088	4.2799	-5.3260
250.0	-1.0662	-2.5514	-1.8695	3.3305	1.4258	3.5499	-6.1335
260.0	-0.5594	-2.7457	-2.0225	3.4487	1.5806	2.4886	-6.6505
270.0	-0.0005	-2.7773	-2.0451	3.4421	1.6359	1.1998	-6.8669
280.0	0.5584	-2.7455	-2.0226	3.4484	1.6566	-0.1133	-6.6508
290.0	1.0637	-2.5443	-1.8634	3.3208	1.5729	-1.3638	-6.1299
300.0	1.4602	-2.2291	-1.6157	3.1083	1.4161	-2.3878	-5.3240
310.0	1.7030	-1.8235	-1.2977	2.8057	1.1984	-3.0660	-4.3102
320.0	1.7624	-1.3722	-0.9455	2.4164	0.9443	-3.3246	-3.2053
330.0	1.6439	-0.9317	-0.6062	1.9754	0.6833	-3.1289	-2.1341
340.0	1.3710	-0.5449	-0.3193	1.5013	0.4436	-2.5243	-1.2170
350.0	1.0111	-0.2501	-0.1150	1.0418	0.2507	-1.6706	-0.5475
360.0	0.9415	-0.0001	0.0002	0.9415	0.1000	-1.4725	0.0000

TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

hh) ROLL ANGLE = 330°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000
10.0	1.0609	0.2835	0.0935	1.0955	-0.0592	-1.9251	0.6155
20.0	1.5028	0.6497	0.2725	1.6512	-0.2491	-3.1647	1.4375
30.0	1.8199	1.1324	0.5227	2.1971	-0.5194	-4.2006	2.5792
40.0	1.9704	1.6940	0.8259	2.7171	-0.8466	-4.8508	3.9202
50.0	1.9083	2.2658	1.1344	3.1643	-1.1936	-4.9617	5.3079
60.0	1.6433	2.7873	1.4185	3.5263	-1.5216	-4.5776	6.5851
70.0	1.1986	3.1923	1.6390	3.7778	-1.7925	-3.7229	7.6066
80.0	0.6287	3.4413	1.7761	3.9187	-1.9802	-2.5035	8.2651
90.0	-0.0005	3.4805	1.7926	3.9105	-2.0491	-1.0503	8.4745
100.0	-0.6279	3.4377	1.7727	3.9138	-2.0565	0.4319	8.2618
110.0	-1.1949	3.1879	1.6359	3.7715	-1.9436	1.8156	7.6085
120.0	-1.6381	2.7849	1.4168	3.5211	-1.7359	2.9282	6.5842
130.0	-1.9012	2.2624	1.1319	3.1565	-1.4533	3.6862	5.3089
140.0	-1.9598	1.6896	0.8205	2.7055	-1.1300	3.8778	3.9209
150.0	-1.8155	1.1326	0.5221	2.1932	-0.8017	3.5983	2.5801
160.0	-1.5003	0.6507	0.2725	1.6492	-0.5051	2.8555	1.4381
170.0	-1.0636	0.2852	0.0935	1.0985	-0.2716	1.8207	0.6159
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.0665	-0.2838	-0.0947	1.1012	0.0548	1.9259	-0.6164
200.0	-1.4947	-0.6462	-0.2716	1.6424	0.2427	3.1658	-1.4395
210.0	-1.8073	-1.1245	-0.5198	2.1820	0.5106	4.2013	-2.5869
220.0	-1.9523	-1.6792	-0.8167	2.6927	0.8350	4.8294	-3.9250
230.0	-1.8830	-2.2377	-1.1178	3.1230	1.1796	4.9585	-5.3145
240.0	-1.6187	-2.7483	-1.3453	3.4747	1.5065	4.5729	-6.5433
250.0	-1.1811	-3.1482	-1.6159	3.7243	1.7763	3.7173	-7.6167
260.0	-0.6204	-3.3939	-1.7482	3.8630	1.9657	2.4974	-8.2707
270.0	-0.0004	-3.4507	-1.7775	3.8771	2.0440	1.0473	-8.4865
280.0	0.6194	-3.3926	-1.7482	3.8617	2.0490	-0.4364	-8.2722
290.0	1.1790	-3.1420	-1.6105	3.7168	1.9389	-1.8208	-7.6143
300.0	1.6151	-2.7409	-1.3921	3.4660	1.7357	-2.9454	-6.5911
310.0	1.8764	-2.2289	-1.1136	3.1113	1.4536	-3.6501	-5.3163
320.0	1.9376	-1.6674	-0.8093	2.6725	1.1328	-3.8603	-3.9232
330.0	1.8020	-1.1213	-0.5179	2.1756	0.8065	-3.5988	-2.5814
340.0	1.4813	-0.6411	-0.2685	1.6277	0.5080	-2.8557	-1.4305
350.0	1.0601	-0.2825	-0.0943	1.0946	0.2727	-1.8198	-0.6157
360.0	0.9410	-0.0002	0.0002	0.9410	0.1000	-1.4726	0.0000

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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

11) ROLL ANGLE = 340°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000
10.0	1.1065	0.3098	0.0670	1.1443	-0.0716	-2.6148	0.6682
20.0	1.5835	0.7270	0.1964	1.7408	-0.2909	-3.3482	1.6123
30.0	1.9459	1.2908	0.3028	2.3591	-0.6056	-4.4314	2.9350
40.0	2.0938	1.9284	0.5982	2.9001	-0.9806	-5.0549	4.4925
50.0	2.0341	2.5924	0.8272	3.3903	-1.6829	-5.1387	6.1092
60.0	1.7502	3.1914	1.0343	3.7785	-1.7596	-4.6668	7.5982
70.0	1.2749	3.6555	1.1940	4.0876	-2.0692	-3.6966	8.7919
80.0	0.6692	3.9374	1.2909	4.1946	-2.2833	-2.3465	9.5621
90.0	-0.0005	4.0209	1.3174	4.2281	-2.3760	-0.7753	9.8162
100.0	-0.6707	3.9443	1.2934	4.2022	-2.3691	0.8298	9.5603
110.0	-1.2714	3.6514	1.1919	4.0421	-2.2309	2.2984	8.7930
120.0	-1.7421	3.1833	1.0309	3.7669	-1.9855	3.4574	7.5967
130.0	-2.0161	2.5763	0.8196	3.3651	-1.6531	4.1714	6.1051
140.0	-2.0803	1.9203	0.5946	2.8842	-1.2782	4.3589	4.4931
150.0	-1.9307	1.2849	0.3794	2.3406	-0.8492	3.9902	2.9359
160.0	-1.5765	0.7257	0.1956	1.7375	-0.5557	3.1240	1.6151
170.0	-1.0968	0.3092	0.0660	1.1345	-0.2880	1.9407	0.6686
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1084	-0.3090	-0.0674	1.1460	0.0672	2.0158	-0.6690
200.0	-1.5811	-0.7242	-0.1964	1.7415	0.2834	3.3490	-1.8140
210.0	-1.9241	-1.2	-0.3785	2.3308	0.5956	4.4312	-2.9352
220.0	-2.0786	-1.9138	-0.5939	2.8788	0.9687	5.0545	-4.4966
230.0	-2.0168	-2.5703	-0.8183	3.3607	1.3693	5.1367	-6.1142
240.0	-1.7319	-3.1588	-1.0223	3.7394	1.7450	4.6642	-7.6043
250.0	-1.2638	-3.6242	-1.1823	4.0124	2.0576	3.6949	-8.7996
260.0	-0.6675	-3.9202	-1.2840	4.1761	2.2768	2.3483	-9.5669
270.0	-0.0003	-4.0079	-1.3129	4.2152	2.3718	0.7753	-9.8252
280.0	0.6647	-3.9110	-1.2812	4.1662	2.3634	-0.8318	-9.5683
290.0	1.2590	-3.6107	-1.1779	3.9972	2.2271	-2.3015	-9.1963
300.0	1.7253	-3.1466	-1.0173	3.7246	1.9848	-3.4602	-7.5986
310.0	2.0076	-2.5577	-0.8144	3.3449	1.6583	-4.1752	-6.1161
320.0	2.0780	-1.9131	-0.5937	2.8779	1.2852	-4.3592	-4.4947
330.0	1.9135	-1.2697	-0.3756	2.3178	0.9042	-3.9910	-2.9368
340.0	1.5620	-0.7174	-0.1938	1.7210	0.5579	-3.1242	-1.6150
350.0	1.1033	-0.3085	-0.0671	1.1408	0.2903	-1.9400	-0.6664
360.0	0.9405	-0.0003	0.0002	0.9405	0.1001	-1.4726	0.0000

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TABLE I - SPACE OPERATIONS CENTER FIRST STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

jj) ROLL ANGLE = 350°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000
10.0	1.1367	0.3265	0.0351	1.1763	-0.0742	-2.0644	0.7006
20.0	1.6431	0.7791	0.1041	1.8126	-0.3172	-3.4347	1.7219
30.0	2.0154	1.3873	0.2019	2.4443	-0.6548	-4.5176	3.1593
40.0	2.1714	2.0807	0.3159	3.0157	-1.0675	-5.1071	4.8550
50.0	2.1072	2.7981	0.4353	3.5232	-1.5049	-5.1461	6.6164
60.0	1.8152	3.4505	0.5449	3.9323	-1.9128	-4.5710	8.2410
70.0	1.3224	3.9553	0.6310	4.2154	-2.2482	-3.5077	9.5446
80.0	0.6967	4.2769	0.6845	4.3858	-2.4843	-2.0365	10.3872
90.0	-0.0006	4.3763	0.6990	4.4311	-2.5905	-0.4116	10.6745
100.0	-0.6964	4.2731	0.6832	4.3820	-2.569	1.2622	10.3851
110.0	-1.3180	3.9500	0.6290	4.2087	-2.4146	2.7652	9.5408
120.0	-1.8052	3.4365	0.5421	3.9140	-2.1452	3.9251	8.2297
130.0	-2.0995	2.7957	0.4342	3.5148	-1.7869	4.6152	6.6169
140.0	-2.1620	2.0760	0.3142	3.0054	-1.3764	4.7393	4.8560
150.0	-2.0015	1.3829	0.1998	2.4316	-0.9619	4.2848	3.1648
160.0	-1.6312	0.7768	0.1051	1.8006	-0.5888	3.5164	1.7227
170.0	-1.1222	0.3255	0.0545	1.1619	-0.2990	2.0241	0.7010
180.0	-0.9229	-0.0004	-0.0003	0.9229	-0.1001	1.4732	0.0000
190.0	-1.1363	-0.3264	-0.0360	1.1759	0.0751	2.0652	-0.7012
200.0	-1.6346	-0.7746	-0.1041	1.8031	0.3091	3.4551	-1.7232
210.0	-2.0065	-1.3817	-0.2017	2.4355	0.6449	4.5181	-3.1616
220.0	-2.1682	-2.0770	-0.3154	3.0109	1.0579	5.1079	-4.8583
230.0	-2.1030	-2.7917	-0.4337	3.5155	1.4935	5.1261	-6.6198
240.0	-1.8069	-3.4342	-0.5416	3.9137	1.9017	4.5701	-8.2446
250.0	-1.3197	-3.9467	-0.6281	4.2061	2.2427	3.5079	-9.5498
260.0	-0.6956	-4.2634	-0.6810	4.3720	2.4782	2.0666	-10.3868
270.0	-0.0004	-4.3776	-0.6990	4.4324	2.5907	0.4153	-10.6802
280.0	0.6944	-4.2610	-0.6807	4.3694	2.5718	-1.2616	-10.3905
290.0	1.3165	-3.9195	-0.6235	4.1771	2.4125	-2.7664	-9.5346
300.0	1.7972	-3.4150	-0.5479	3.8919	2.1075	-3.9296	-8.2341
310.0	2.0929	-2.7766	-0.4319	3.4973	1.7914	-4.6152	-6.6121
320.0	2.1583	-2.0669	-0.3144	2.9968	1.5823	-4.7392	-4.8563
330.0	1.9918	-1.3714	-0.1988	2.4175	0.9688	-4.2650	-3.1606
340.0	1.6241	-0.7703	-0.1030	1.7917	0.5925	-3.5166	-1.7225
350.0	1.1288	-0.3243	-0.0355	1.1681	0.3016	-2.0836	-0.7006
360.0	0.9379	-0.0004	0.0002	0.9379	0.1001	-1.4728	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	1.8723	0.3561	0.2836	1.9174	-0.0326	-0.0917	0.0213
20.0	2.2800	0.8732	0.7113	[illegible]	-0.2228	-0.3773	0.0585
30.0	2.5856	1.0628	1.2610	[illegible]	-0.4727	-0.7642	0.0870
40.0	2.6850	1.4908	1.9324	3.6115	-0.7585	-1.2004	0.1266
50.0	2.5184	1.9045	2.5732	4.0553	-1.0559	-1.6358	0.1629
60.0	2.1268	2.2749	3.1558	4.4152	-1.3407	-2.0405	0.1946
70.0	1.5085	2.5881	3.7628	4.8909	-1.5541	-2.2962	0.1906
80.0	0.7871	2.7028	3.8272	4.7315	-1.7275	-2.5021	0.2079
90.0	-0.0003	2.7159	3.8498	4.6919	-1.7814	-2.5246	0.2197
100.0	-0.7746	2.6829	3.7909	4.6886	-1.8182	-2.4945	0.2202
110.0	-1.5083	2.5341	3.5639	4.4068	-1.7588	-2.3652	0.1940
120.0	-2.0859	2.2487	3.1063	4.3463	-1.6134	-2.1026	0.1552
130.0	-2.5082	1.9015	2.5679	4.0441	-1.4281	-1.7395	0.1499
140.0	-2.6997	1.4977	1.9464	3.6329	-1.1914	-1.3224	0.1282
150.0	-2.6159	1.0738	1.2995	3.0966	-0.9225	-0.9151	0.0878
160.0	-2.3002	0.6777	0.7189	2.4903	-0.6570	-0.5470	0.0514
170.0	-1.8703	0.3547	0.2828	1.9152	-0.4323	-0.2715	0.0219
180.0	-1.9181	-0.0004	0.0001	1.9181	-0.2084	-0.0923	0.0080
190.0	-1.8702	-0.3726	-0.2832	1.9150	-0.0275	0.0935	-0.0221
200.0	-2.2921	-0.7334	-0.7157	2.4810	0.2182	0.3822	-0.0528
210.0	-2.6049	-1.0677	-1.2926	3.0825	0.4681	0.7709	-0.0915
220.0	-2.6905	-1.4941	-1.9392	3.6207	0.7567	1.2093	-0.1327
230.0	-2.5144	-1.8031	-2.5695	4.0498	1.0532	1.6413	-0.1710
240.0	-2.1219	-2.2720	-3.1503	4.4074	1.5322	2.0338	-0.2041
250.0	-1.5210	-2.5412	-3.5741	4.6228	1.5639	2.3252	-0.2115
260.0	-0.7881	-2.6956	-3.8142	4.7171	1.7175	2.4927	-0.2184
270.0	-0.0007	-2.7098	-3.8314	4.6730	1.7784	2.5132	-0.2271
280.0	0.7771	-2.6743	-3.7767	4.6727	1.8077	2.4812	-0.2316
290.0	1.5107	-2.5217	-3.5457	4.5869	1.7510	2.3478	-0.2004
300.0	2.1027	-2.2469	-3.1162	4.3614	1.6193	2.0962	-0.1550
310.0	2.5075	-1.8952	-2.5605	4.0363	1.4297	1.7301	-0.1512
320.0	2.6887	-1.4902	-1.9340	3.6152	1.1913	1.3146	-0.1306
330.0	2.5787	-1.0575	-1.2757	3.0499	0.8152	0.8958	-0.0901
340.0	2.2656	-0.6675	-0.7052	2.4520	0.6531	0.5363	-0.0519
350.0	1.8668	-0.3523	-0.2817	1.9114	0.4321	0.2709	-0.0219
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	2.0062	0.4390	0.2697	2.0606	-0.0788	-0.0839	0.0171
20.0	2.5895	0.9004	0.7158	2.8187	-0.3516	-0.3807	0.0445
30.0	3.0332	1.4907	1.3322	3.6161	-0.7257	-0.7972	0.0812
40.0	3.1863	2.1432	2.0327	4.3272	-1.1601	-1.2730	0.1228
50.0	3.0407	2.8047	2.7553	4.9523	-1.6158	-1.7591	0.1653
60.0	2.5856	3.3896	3.4009	5.4358	-2.0438	-2.2013	0.2014
70.0	1.8603	3.8178	3.8751	5.7317	-2.3789	-2.5176	0.2203
80.0	0.9746	4.1044	4.1935	5.9308	-2.6314	-2.7433	0.2441
90.0	-0.0007	4.1233	4.2133	5.8779	-2.7034	-2.7615	0.2550
100.0	-0.9685	4.0926	4.1775	5.9102	-2.7476	-2.7430	0.2527
110.0	-1.8559	3.8208	3.8781	5.7340	-2.6257	-2.5516	0.2332
120.0	-2.5566	3.3637	3.3688	5.3856	-2.3802	-2.2421	0.1976
130.0	-3.0366	2.8056	2.7561	4.9506	-2.0526	-1.8633	0.1517
140.0	-3.1982	2.1525	2.0427	4.3451	-1.6488	-1.3864	0.1248
150.0	-3.0238	1.4883	1.3296	3.6063	-1.2168	-0.9318	0.0825
160.0	-2.6157	0.9080	0.7243	2.8473	-0.8280	-0.5536	0.0453
170.0	-2.0201	0.4393	0.2713	2.0745	-0.4971	-0.2659	0.0176
180.0	-1.9195	-0.0002	0.0002	1.9195	-0.2086	-0.0923	0.0000
190.0	-2.0147	-0.4362	-0.2702	2.0687	0.0723	0.0852	-0.0180
200.0	-2.6106	-0.9031	-0.7225	2.8410	0.3479	0.3877	-0.0471
210.0	-3.0444	-1.4934	-1.3389	3.6293	0.7173	0.8012	-0.0863
220.0	-3.2124	-2.1580	-2.0515	4.3626	1.1567	1.2827	-0.1309
230.0	-3.0315	-2.7966	-2.7456	4.9368	1.6033	1.7570	-0.1750
240.0	-2.5815	-3.3849	-3.3983	5.4294	2.0353	2.1995	-0.2134
250.0	-1.8620	-3.8202	-3.8785	5.7362	2.3813	2.5270	-0.2286
260.0	-0.9743	-4.0958	-4.1817	5.9164	2.6209	2.7350	-0.2579
270.0	-0.0009	-4.1245	-4.2099	5.8761	2.7053	2.7595	-0.2617
280.0	0.9657	-4.0765	-4.1580	5.8849	2.7384	2.7271	-0.2637
290.0	1.8546	-3.8025	-3.8582	5.7083	2.6191	2.5379	-0.2394
300.0	2.5619	-3.3582	-3.3651	5.3827	2.3815	2.2340	-0.1989
310.0	3.0219	-2.7152	-2.7348	4.9186	2.0489	1.8429	-0.1575
320.0	3.1926	-2.1451	-2.0356	4.3342	1.6538	1.3832	-0.1289
330.0	3.0232	-1.4841	-1.3267	3.6032	1.2227	0.9305	-0.0854
340.0	2.5737	-0.8934	-0.7091	2.8007	0.8201	0.5393	-0.0463
350.0	2.0044	-0.4352	-0.2686	2.0583	0.4956	0.2632	-0.0178
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -90°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000
10.0	2.1298	0.5106	0.2403	2.1928	-0.1225	-0.0645	0.0118
20.0	2.8846	1.1301	0.6705	3.1541	-0.4859	-0.3533	0.0354
30.0	3.9218	1.8225	1.2605	4.1047	-0.9057	-0.7508	0.0682
40.0	5.6568	2.8289	1.9621	5.0048	-1.5816	-1.2261	0.1084
50.0	3.5126	3.7441	2.6768	5.7229	-2.2091	-1.7125	0.1495
60.0	3.0005	4.5635	3.3181	6.3707	-2.7945	-2.1510	0.1869
70.0	2.1785	5.1912	3.8148	6.7856	-3.2652	-2.4881	0.2178
80.0	1.1384	5.5766	4.1145	7.0091	-3.5921	-2.6967	0.2393
90.0	-0.6009	5.6133	4.1342	6.9573	-3.6910	-2.7175	0.2496
100.0	-1.1379	5.5723	4.1099	7.0028	-3.7311	-2.7012	0.2411
110.0	-2.1705	5.1864	3.8083	6.7360	-3.5426	-2.5012	0.2335
120.0	-2.9967	4.5627	3.3186	6.3726	-3.1928	-2.1926	0.1982
130.0	-3.5202	3.7540	2.6849	5.7876	-2.7047	-1.7958	0.1526
140.0	-3.6535	2.8294	1.9610	5.0021	-2.1217	-1.3385	0.1090
150.0	-3.4165	1.8214	1.2598	4.0995	-1.5259	-0.8926	0.0688
160.0	-2.8933	1.1337	0.6735	3.1639	-0.9898	-0.5195	0.0357
170.0	-2.1448	0.5171	0.2422	2.2080	-0.5539	-0.2480	0.0122
180.0	-1.9115	-0.0002	0.0000	1.9115	-0.2086	-0.0926	0.0000
190.0	-2.1317	-0.5130	-0.2406	2.1944	0.1132	0.0662	-0.0120
200.0	-2.8790	-1.1247	-0.6690	3.1471	0.4750	0.3540	-0.0378
210.0	-3.4089	-1.9128	-1.2557	4.0884	0.9680	0.7497	-0.0736
220.0	-3.6354	-2.8112	-1.9492	4.9744	1.5585	1.2209	-0.1170
230.0	-3.4790	-3.7078	-2.6471	5.7154	2.1776	1.6998	-0.1608
240.0	-2.9685	-4.5134	-3.2795	6.3040	2.7566	2.1326	-0.2011
250.0	-2.1522	-5.1327	-3.7659	6.7055	3.2259	2.4645	-0.2349
260.0	-1.1266	-5.5108	-4.0639	6.9253	3.5514	2.6728	-0.2582
270.0	-0.0008	-5.5619	-4.0975	6.8944	3.6586	2.6947	-0.2632
280.0	1.1243	-5.5093	-4.0617	6.9229	3.7017	2.6778	-0.2597
290.0	2.1438	-5.1106	-3.7482	6.6758	3.5105	2.4718	-0.2490
300.0	2.9577	-4.4983	-3.2664	6.2813	3.1675	2.1633	-0.2124
310.0	3.4748	-3.7025	-2.6430	5.7076	2.6897	1.7749	-0.1616
320.0	3.6224	-2.8015	-1.9401	4.9559	2.1222	1.3300	-0.1159
330.0	3.3825	-1.9002	-1.2447	4.0571	1.5248	0.8837	-0.0730
340.0	2.8396	-1.1131	-0.6583	3.1047	0.9848	0.5101	-0.0373
350.0	2.1150	-0.5102	-0.2379	2.1773	0.5513	0.2425	-0.0126
360.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000
10.0	2.2299	0.5837	-0.1962	2.3008	-0.1599	-0.0363	0.0059
20.0	3.0991	1.3264	0.5606	3.4009	-0.6009	-0.2818	0.0226
30.0	5.7277	2.3853	1.0689	6.4936	-1.2178	-0.6260	0.0486
40.0	4.0094	3.4332	1.6738	5.5203	-1.9563	-1.0381	0.0824
50.0	3.8650	4.5743	2.2930	6.3972	-2.7295	-1.4595	0.1179
60.0	3.3153	5.6095	2.8567	7.1017	-3.4590	-1.8473	0.1540
70.0	2.4095	6.4818	3.2887	7.5790	-4.0438	-2.1426	0.1820
80.0	1.2626	6.8956	3.5573	7.8516	-4.4505	-2.3308	0.2057
90.0	-0.0007	6.9600	3.5845	7.8197	-4.5755	-2.3557	0.2180
100.0	-1.2635	6.8960	3.5568	7.8520	-4.6115	-2.3417	0.2041
110.0	-2.4004	6.3928	3.2824	7.5656	-4.3508	-2.1568	0.2014
120.0	-3.3035	5.5991	2.8511	7.0856	-3.8907	-1.8848	0.1660
130.0	-3.8648	4.5784	2.2954	6.4007	-3.2695	-1.5406	0.1235
140.0	-4.0004	3.4287	1.6704	5.5099	-2.5361	-1.1496	0.0826
150.0	-3.7252	2.3052	1.0692	4.4915	-1.7961	-0.7689	0.0494
160.0	-3.1124	1.3319	0.5638	3.4156	-1.1331	-0.4489	0.0230
170.0	-2.2487	0.5857	0.1978	2.3198	-0.6039	-0.2189	0.0062
180.0	-1.9129	-0.0004	0.0001	1.9129	-0.2084	-0.0926	0.0000
190.0	-2.2414	-0.5808	-0.1974	2.3118	-0.1504	-0.0377	-0.0068
200.0	-3.1020	-1.3233	-0.5616	3.4029	0.5890	0.2837	-0.0249
210.0	-3.7199	-2.2958	-1.0677	4.4625	1.1993	0.6278	-0.0534
220.0	-3.9886	-3.4108	-1.6644	5.4890	1.9288	1.0342	-0.0892
230.0	-3.8318	-4.5331	-2.2712	6.3402	2.6943	1.4509	-0.1279
240.0	-3.2758	-5.5420	-2.8196	7.0153	3.4087	1.8288	-0.1663
250.0	-2.3835	-6.3329	-3.2511	7.4963	3.9976	2.1243	-0.1973
260.0	-1.2487	-6.8099	-3.5120	7.7539	4.3955	2.3070	-0.2196
270.0	-0.0007	-6.9026	-3.5570	7.7563	4.5353	2.3577	-0.2288
280.0	1.2480	-6.8124	-3.5136	7.7567	4.5653	2.3169	-0.2198
290.0	2.3756	-6.3121	-3.2401	7.4715	4.3165	2.1320	-0.2164
300.0	3.2659	-5.5257	-2.8113	6.9945	3.8642	1.8620	-0.1823
310.0	3.8192	-4.5176	-2.2630	6.3186	3.2879	1.5228	-0.1323
320.0	3.9743	-3.4000	-1.6573	5.4697	2.5379	1.1448	-0.0883
330.0	3.7045	-2.2874	-1.0621	4.4641	1.8000	0.7656	-0.0529
340.0	3.0611	-1.3097	-0.5527	3.3589	1.1279	0.4418	-0.0245
350.0	2.2166	-0.5769	-0.1948	2.2865	0.6011	0.2155	-0.0065
360.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

e) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000
10.0	-2.3138	0.6367	-0.1397	2.3908	-0.1891	-0.0001	-0.0006
20.0	3.2504	1.4783	0.4016	3.5765	-0.6917	-0.1785	0.0072
30.0	3.9716	2.6214	0.7385	4.8044	-1.4083	-0.4367	0.0234
40.0	4.2599	3.9087	1.2150	5.8912	-2.2542	-0.7384	0.0462
50.0	4.1174	5.2319	1.6707	6.8504	-3.1470	-1.0532	0.0730
60.0	3.5295	6.4210	2.0817	7.6067	-3.9795	-1.3400	0.1016
70.0	2.5647	7.3369	2.3926	8.1263	-4.6512	-1.5598	0.1293
80.0	1.3445	7.8929	2.5870	8.4089	-5.1040	-1.6951	0.1459
90.0	0.0007	8.0245	2.6288	8.4395	-5.2694	-1.7258	0.1519
100.0	-1.3449	7.8903	2.5857	8.4062	-5.2652	-1.7011	0.1453
110.0	-2.5520	7.3175	2.3880	8.1018	-4.9673	-1.5696	0.1443
120.0	-3.5016	6.3827	2.0663	7.5570	-4.4123	-1.3668	0.1151
130.0	-4.0842	5.1988	1.6565	6.8015	-3.6873	-1.1204	0.0779
140.0	-4.2466	3.8998	1.2109	5.8745	-2.8606	-0.8508	0.0458
150.0	-3.9504	2.6106	0.7748	4.7802	-2.0078	-0.5768	0.0235
160.0	-3.2527	1.4808	0.4028	3.5796	-1.2391	-0.3446	0.0074
170.0	-2.3207	0.6371	0.1390	2.3977	-0.6821	-0.1807	-0.0006
180.0	-1.9129	-0.0004	0.0001	1.9129	-0.2084	-0.0924	0.0000
190.0	-2.3155	-0.6312	-0.1401	2.3916	0.1787	0.0805	0.0001
200.0	-3.2703	-1.4807	-0.4048	3.5963	0.6806	0.1814	-0.0090
210.0	-3.9481	-2.6003	-0.7751	4.7734	1.5834	0.4365	-0.0271
220.0	-4.2432	-3.8865	-1.2104	5.8640	2.2248	0.7372	-0.0515
230.0	-4.0893	-5.1928	-1.6573	6.8002	3.1057	1.0860	-0.0799
240.0	-3.4987	-6.3617	-2.0622	7.5372	3.9290	1.3291	-0.1102
250.0	-2.5468	-7.2824	-2.3789	8.0660	4.6094	1.5502	-0.1360
260.0	-1.3412	-7.8574	-2.5765	8.3719	5.0760	1.6908	-0.1588
270.0	-0.0005	-8.0182	-2.6275	8.4333	5.2698	1.7274	-0.1715
280.0	1.3393	-7.8548	-2.5753	8.3687	5.2580	1.6992	-0.1590
290.0	2.5410	-7.2665	-2.3723	8.0478	4.9583	1.5678	-0.1565
300.0	3.4891	-6.3448	-2.0547	7.5165	4.4189	1.3680	-0.1239
310.0	4.0830	-5.1829	-1.6537	6.7885	3.7021	1.1213	-0.0864
320.0	4.2464	-3.8902	-1.2106	5.8688	2.8740	0.8500	-0.0511
330.0	3.9309	-2.5905	-0.7703	4.7530	2.0152	0.5750	-0.0269
340.0	3.2477	-1.4717	-0.4014	3.5717	1.2447	0.3429	-0.0090
350.0	2.3028	-0.6301	-0.1388	2.3789	0.6413	0.1797	0.0002
360.0	1.9037	-0.0003	0.0003	1.903	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000
10.0	2.3654	0.6697	0.0733	2.4462	-0.2072	0.0422	-0.0073
20.0	3.3702	1.5854	0.2123	3.7136	-0.7535	-0.0553	-0.0094
30.0	4.1103	2.8179	0.4107	4.9827	-1.5300	-0.1964	-0.0057
40.0	4.4170	4.2174	0.6408	6.1247	-2.4465	-0.3622	0.0038
50.0	4.2692	5.6525	0.8801	7.1254	-3.4153	-0.5359	0.0185
60.0	3.6634	6.9476	1.0970	7.9219	-4.3196	-0.6949	0.0375
70.0	2.6584	7.9335	1.2642	8.4571	-5.0352	-0.8151	0.0539
80.0	1.4000	8.5759	1.3713	8.7947	-5.5512	-0.8965	0.0718
90.0	-0.0010	8.7310	1.3929	8.8400	-5.7314	-0.9136	0.0815
100.0	-1.4001	8.5715	1.3700	8.7903	-5.7248	-0.9049	0.0714
110.0	-2.6524	7.9317	1.2625	8.4532	-5.3807	-0.8572	0.0641
120.0	-3.6398	6.9162	1.0908	7.8824	-4.7780	-0.7378	0.0402
130.0	-4.2603	5.6462	0.8787	7.1148	-3.9931	-0.6161	0.0191
140.0	-4.4144	4.2172	0.6404	6.1226	-3.0803	-0.4768	0.0037
150.0	-4.0985	2.8127	0.4091	4.9699	-2.1496	-0.3382	-0.0053
160.0	-3.3664	1.5854	0.2124	3.7100	-1.3147	-0.2202	-0.0091
170.0	-2.3794	0.6720	0.0730	2.4603	-0.6683	-0.1380	-0.0075
180.0	-1.9155	-0.0005	0.0001	1.9155	-0.2084	-0.0924	0.0000
190.0	-2.3715	-0.6666	-0.0743	2.4516	0.1971	-0.0420	0.0071
200.0	-3.3776	-1.5833	-0.2141	3.7199	0.7404	0.0572	0.0084
210.0	-4.1151	-2.8138	-0.4125	4.9851	1.5139	0.1986	0.0038
220.0	-4.4177	-4.2115	-0.6416	6.1216	2.4245	0.3643	-0.0076
230.0	-4.2645	-5.6402	-0.8788	7.1129	3.3893	0.5353	-0.0222
240.0	-3.6491	-6.9157	-1.0924	7.8869	4.2828	0.6922	-0.0413
250.0	-2.6560	-7.9217	-1.2624	8.4451	5.0203	0.8162	-0.0599
260.0	-1.3977	-8.5454	-1.3661	8.7639	5.5236	0.8942	-0.0789
270.0	-0.0007	-8.7513	-1.3977	8.8609	5.7502	0.9187	-0.0932
280.0	1.3965	-8.5445	-1.3662	8.7629	5.7121	0.9030	-0.0788
290.0	2.6466	-7.8931	-1.2571	8.4145	5.3749	0.8378	-0.0600
300.0	3.6312	-6.8817	-1.0853	7.8478	4.7770	0.7336	-0.0490
310.0	4.2497	-5.6193	-0.8751	7.0872	3.9962	0.6127	-0.0249
320.0	4.4051	-4.1994	-0.6395	6.1040	3.0864	0.4752	-0.0071
330.0	4.0810	-2.7924	-0.4070	4.9446	2.1557	0.3372	0.0036
340.0	3.3571	-1.5747	-0.2120	3.6976	1.3190	0.2200	0.0085
350.0	2.3587	-0.6641	-0.0733	2.4386	0.6677	0.1380	0.0072
360.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000

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TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	2.3854	0.6822	0.0002	2.4676	-0.2150	0.0900	-0.0142
20.0	3.4138	1.6841	0.0000	3.7038	-0.7776	0.0825	-0.0267
30.0	4.1538	3.0338	-0.0006	5.0803	-1.5713	0.0701	-0.0359
40.0	4.4688	4.3234	-0.0001	6.2022	-2.5154	0.0569	-0.0413
50.0	4.3171	5.2956	-0.0001	7.2130	-3.5105	0.0413	-0.0413
60.0	3.7060	7.1258	-0.0003	8.0240	-4.4413	0.0253	-0.0344
70.0	2.6876	8.1288	0.0000	8.5577	-5.1706	0.0126	-0.0238
80.0	1.4117	8.7594	0.0000	8.8712	-5.6676	0.0044	-0.0115
90.0	-0.0010	9.0222	0.0000	9.0222	-5.9285	0.0000	0.0000
100.0	-1.4133	8.7655	-0.0002	8.8776	-5.8528	-0.0044	-0.0117
110.0	-2.6838	8.1396	-0.0001	8.5625	-5.5245	-0.0140	-0.0267
120.0	-3.6778	7.0859	0.0000	7.9753	-4.8888	-0.0253	-0.0345
130.0	-4.3150	5.7974	-0.0001	7.2146	-4.0924	-0.0389	-0.0366
140.0	-4.4665	4.3258	0.0000	6.2020	-3.1485	-0.0564	-0.0408
150.0	-4.1488	2.8826	-0.0001	5.0342	-2.1962	-0.0707	-0.0359
160.0	-3.4004	1.6199	-0.0001	3.7493	-1.3358	-0.0821	-0.0266
170.0	-2.3978	0.6847	0.0000	2.4802	-0.6765	-0.0898	-0.0142
180.0	-1.9155	-0.0005	0.0001	1.9155	-0.2084	-0.0924	0.0000
190.0	-2.4006	-0.6803	0.0000	2.4822	0.2048	-0.0898	0.0142
200.0	-3.4252	-1.6226	-0.0001	3.7736	0.7654	-0.0823	0.0267
210.0	-4.1737	-2.8885	-0.0003	5.0588	1.5607	-0.0708	0.0361
220.0	-4.4694	-4.3166	-0.0001	6.1984	2.4930	-0.0563	0.0407
230.0	-4.3202	-5.7905	-0.0002	7.2127	3.4885	-0.0410	0.0408
240.0	-3.6983	-7.1048	-0.0003	8.0021	4.4018	-0.0250	0.0342
250.0	-2.6899	-8.1306	0.0003	8.5603	5.1506	-0.0135	0.0249
260.0	-1.4152	-8.7636	-0.0001	8.8761	5.6635	-0.0043	0.0116
270.0	-0.0008	-9.0226	0.0000	9.0226	5.9286	0.0000	0.0000
280.0	1.4143	-8.7659	0.0000	8.8783	5.8571	0.0043	0. .16
290.0	2.6795	-8.0988	0.0000	8.5268	5.5112	0.0125	0.0237
300.0	3.6789	-7.0676	0.0001	7.9601	4.9057	0.0247	0.0338
310.0	4.3089	-5.7740	0.0001	7.1927	4.1008	0.0409	0.0408
320.0	4.4583	-4.3060	0.0001	6.1830	3.1577	0.0564	0.0410
330.0	4.1391	-2.8653	0.0000	5.0171	2.2053	0.0707	0.0359
340.0	3.3877	-1.6082	0.0002	3.7334	1.3438	0.0820	0.0266
350.0	2.3753	-0.6757	0.0001	2.4565	0.6755	0.0901	0.0142
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

h) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	2.3720	0.6710	-0.0734	2.4529	-0.2079	0.1372	-0.0206
20.0	3.3659	1.5835	-0.2119	3.7088	-0.7527	0.2203	-0.0433
30.0	4.1079	2.8166	-0.4100	4.9799	-1.5294	0.3382	-0.0655
40.0	4.4160	4.2156	-0.6409	6.1228	-2.4464	0.4757	-0.0848
50.0	4.2706	5.6539	-0.8799	7.1273	-3.4180	0.6177	-0.0992
60.0	3.6631	6.9472	-1.0959	7.9213	-4.3197	0.7442	-0.1040
70.0	2.6563	7.9270	-1.2625	8.4501	-5.0330	0.8415	-0.1038
80.0	1.3991	8.5700	-1.3700	8.7887	-5.5487	0.9046	-0.0947
90.0	-0.0010	8.7333	-1.3434	8.8424	-5.7325	0.9157	-0.0816
100.0	-1.4018	8.5824	-1.3719	8.8015	-5.7305	0.8974	-0.0944
110.0	-2.6562	7.9830	-1.2656	8.4654	-5.3916	0.8129	-0.1156
120.0	-3.6425	6.9213	-1.0913	7.8882	-4.7819	0.6870	-0.1094
130.0	-4.2645	5.6521	-0.8802	7.1221	-3.9967	0.5367	-0.0982
140.0	-4.4218	4.2247	-0.6424	6.1333	-3.0834	0.3649	-0.0846
150.0	-4.1046	2.8163	-0.4105	4.9770	-2.1533	0.1982	-0.0658
160.0	-3.3715	1.5877	-0.2134	3.7156	-1.3166	0.0564	-0.0452
170.0	-2.3832	0.6733	-0.0737	2.4643	-0.6688	-0.0423	-0.0207
180.0	-1.9155	-0.0005	0.0001	1.9155	-0.2084	-0.0924	0.0000
190.0	-2.3723	-0.6671	0.0736	2.4525	0.1968	-0.1373	0.0209
200.0	-3.3816	-1.5841	0.2143	3.7259	0.7409	-0.2221	0.0441
210.0	-4.1112	-2.8114	0.4117	4.9805	1.5114	-0.3403	0.0675
220.0	-4.4245	-4.2172	0.6425	6.1305	2.4262	-0.4772	0.0879
230.0	-4.2638	-5.6387	0.8780	7.1112	3.3879	-0.6170	0.1026
240.0	-3.6461	-6.9091	1.0903	7.8794	4.2785	-0.7410	0.1085
250.0	-2.6554	-7.9192	1.2616	8.4425	5.0173	-0.8421	0.1097
260.0	-1.3981	-8.5472	1.3661	8.7657	5.5241	-0.9028	0.1017
270.0	-0.0007	-8.7546	1.3984	8.8643	5.7514	-0.9190	0.0931
280.0	1.3975	-8.5488	1.3671	8.7673	5.7123	-0.8945	0.1015
290.0	2.6492	-7.8996	1.2588	8.4217	5.3782	-0.8120	0.1173
300.0	3.6378	-6.8924	1.0881	7.8607	4.7829	-0.6858	0.1153
310.0	4.2535	-5.6238	0.8763	7.0931	3.9984	-0.5316	0.1049
320.0	4.4105	-4.2039	0.6396	6.1110	3.0884	-0.3623	0.0878
330.0	4.0862	-2.7959	0.4089	4.9509	2.1575	-0.1970	0.0668
340.0	3.3536	-1.5733	0.2122	3.6938	1.3184	-0.0561	0.0437
350.0	2.3602	-0.6641	0.0732	2.4400	0.6674	0.0465	0.0207
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	2.3142	0.6366	-0.1394	2.3913	-0.1894	0.1401	-0.0261
20.0	3.2476	1.4269	-0.3010	3.3732	-0.6911	0.3430	-0.0574
30.0	3.9665	2.6101	-0.5700	4.1902	-1.4085	0.5700	-0.0911
40.0	4.2554	3.9041	-1.2136	5.8847	-2.2523	0.8507	-0.1231
50.0	4.1106	5.2241	-1.6673	6.8396	-3.1435	1.1336	-0.1500
60.0	3.5254	6.6182	-2.0782	7.7066	-3.9763	1.3379	-0.1651
70.0	2.5622	7.3361	-2.3442	8.0980	-4.3467	1.5841	-0.1724
80.0	1.3455	7.8984	-2.5890	8.4148	-5.1058	1.7045	-0.1678
90.0	-0.0007	8.0150	-2.6244	8.4291	-5.2608	1.7217	-0.1572
100.0	-1.2461	7.8965	-2.5879	8.4128	-5.2706	1.6946	-0.1672
110.0	-2.6574	7.3321	-2.3949	8.1167	-4.8823	1.6502	-0.1919
120.0	-3.5028	6.3839	-2.0669	7.5587	-4.4159	1.3201	-0.1773
130.0	-4.1024	5.2197	-1.6655	6.8307	-3.7020	1.0438	-0.1558
140.0	-4.2643	3.9146	-1.2176	5.8987	-2.8702	0.7407	-0.1234
150.0	-3.8575	2.6148	-0.7778	4.7887	-2.0125	0.4378	-0.0911
160.0	-3.2596	1.4835	-0.4040	3.5870	-1.2416	0.1813	-0.0575
170.0	-2.3283	0.6390	-0.1404	2.4055	-0.6453	0.0015	-0.0263
180.0	-1.9181	-0.0004	0.0001	1.9181	-0.2084	-0.0923	0.0000
190.0	-2.3259	-0.6381	0.1397	2.4023	0.1803	-0.1809	0.0267
200.0	-3.2794	-1.4828	0.4060	3.6056	0.6826	-0.3478	0.0595
210.0	-3.9661	-2.6109	0.7192	4.7947	1.5886	-0.5805	0.0950
220.0	-4.2623	-3.9032	1.2162	5.8901	2.2321	-0.8530	0.1288
230.0	-4.0979	-5.2028	1.6686	6.8138	3.1127	-1.1307	0.1574
240.0	-3.5011	-6.3651	2.0623	7.5412	3.9336	-1.3805	0.1751
250.0	-2.5511	-7.2940	2.3820	8.0788	4.6148	-1.5765	0.1846
260.0	-1.3417	-7.8595	2.5770	8.3742	5.0762	-1.6995	0.1868
270.0	-0.0005	-8.0151	2.6266	8.4301	5.2642	-1.7257	0.1716
280.0	1.3405	-7.8590	2.5771	8.3735	5.2581	-1.6907	0.1806
290.0	2.5451	-7.2763	2.3765	8.0593	4.9634	-1.5432	0.2036
300.0	3.4983	-6.3589	2.0609	7.5344	4.4262	-1.3217	0.1870
310.0	4.0929	-5.1936	1.6579	6.8047	3.7077	-1.0416	0.1630
320.0	4.2500	-3.8925	1.2158	5.8729	2.8742	-0.7370	0.1280
330.0	3.9461	-2.5985	0.8248	4.7708	2.0188	-0.4359	0.0941
340.0	3.2454	-1.4713	0.4013	3.5694	1.2442	-0.1788	0.0589
350.0	2.2988	-0.6292	0.1384	2.3747	0.6400	-0.0013	0.0265
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	2.2322	0.5839	-0.1962	2.3031	-0.1603	0.2170	-0.0306
20.0	3.1003	1.3266	-0.5598	3.4020	-0.6016	0.4463	-0.0688
30.0	3.7275	2.3045	-1.0696	4.4933	-1.2180	0.7694	-0.1114
40.0	4.0016	3.4265	-1.6702	5.5095	-1.9539	1.1495	-0.1531
50.0	3.8505	4.5583	-2.2842	6.3738	-2.7243	1.5363	-0.1887
60.0	3.3071	5.5972	-2.8493	7.0852	-3.4545	1.8939	-0.2126
70.0	2.4028	6.3851	-3.2786	7.5583	-4.0384	2.1651	-0.2256
80.0	1.2531	6.8437	-3.5284	7.7916	-4.4106	2.3178	-0.2256
90.0	-0.0008	6.9266	-3.5655	7.7813	-4.5517	2.3427	-0.2164
100.0	-1.2567	6.8594	-3.5370	7.8099	-4.5792	2.3145	-0.2254
110.0	-2.3987	6.3877	-3.2807	7.5608	-4.3491	2.1299	-0.2448
120.0	-3.2867	5.5716	-2.8340	7.0491	-3.8647	1.8182	-0.2248
130.0	-3.8529	4.5651	-2.2873	6.3811	-3.2562	1.4485	-0.1967
140.0	-4.0052	3.4325	-1.6723	5.5163	-2.5394	1.0384	-0.1534
150.0	-3.7317	2.3089	-1.0711	4.4993	-1.7992	0.6295	-0.1113
160.0	-3.1005	1.3276	-0.5618	3.4028	-1.1300	0.2830	-0.0691
170.0	-2.2517	0.5869	-0.1982	2.3229	-0.6044	0.0390	-0.0309
180.0	-1.9181	-0.0004	0.0001	1.9181	-0.2084	-0.0923	0.0000
190.0	-2.2368	-0.5799	0.1960	2.3070	0.1509	-0.2178	0.0314
200.0	-3.1060	-1.3233	0.5618	3.4066	0.5896	-0.4496	0.0713
210.0	-3.7356	-2.3038	1.0725	4.5008	1.2021	-0.7718	0.1160
220.0	-4.0040	-3.4226	1.6710	5.5095	1.9335	-1.1503	0.1604
230.0	-3.8393	-4.5406	2.2747	6.3513	2.6961	-1.5342	0.1995
240.0	-3.2799	-5.5482	2.8227	7.0233	3.4114	-1.8804	0.2259
250.0	-2.3868	-6.3402	3.2539	7.5047	4.0007	-2.1565	0.2422
260.0	-1.2513	-6.8224	3.5178	7.7679	4.4030	-2.3201	0.2426
270.0	-0.0006	-6.9169	3.5635	7.7719	4.5459	-2.3427	0.2302
280.0	1.2499	-6.8203	3.5168	7.7654	4.5747	-2.3117	0.2023
290.0	2.3792	-6.3190	3.2435	7.4800	4.3267	-2.1151	0.2607
300.0	3.2768	-5.5408	2.8200	7.0150	3.8794	-1.8205	0.2411
310.0	3.8360	-4.5340	2.2720	6.3438	3.2607	-1.4473	0.2035
320.0	3.9825	-3.4047	1.6595	5.4793	2.5415	-1.0329	0.1594
330.0	3.7154	-2.2920	1.0654	4.4764	1.8043	-0.6267	0.1152
340.0	3.0747	-1.3141	0.5556	3.3735	1.1299	-0.2784	0.0707
350.0	2.2117	-0.5758	0.1940	2.2815	0.5999	-0.0341	0.0312
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000
10.0	2.1256	0.5156	-0.2394	2.1885	-0.1220	0.2447	-0.0336
20.0	2.8719	1.5250	-0.6662	3.1481	-0.4846	0.5156	-0.0760
30.0	3.4117	2.5061	-1.2569	4.0926	-0.9869	0.6922	-0.1232
40.0	3.6466	2.8217	-1.9556	4.9907	-1.5817	1.3387	-0.1709
50.0	3.5018	3.7330	-2.6667	5.7582	-2.2065	1.7916	-0.2118
60.0	2.9966	4.5568	-3.3140	6.3661	-2.7917	2.2021	-0.2424
70.0	2.1664	5.1648	-3.7913	6.8496	-3.2508	2.4988	-0.2512
80.0	1.1326	5.5515	-4.0945	6.9765	-3.5759	2.6927	-0.2561
90.0	-0.0010	5.5765	-4.1054	6.9106	-3.6599	2.6921	-0.2467
100.0	-1.1339	5.5532	-4.0961	6.9790	-3.7140	2.6791	-0.2596
110.0	-2.1650	5.1390	-3.7891	6.7592	-3.5347	2.4684	-0.2729
120.0	-2.9745	4.5320	-3.2920	6.3263	-3.1631	2.1136	-0.2524
130.0	-3.5004	3.7352	-2.6670	5.7550	-2.6867	1.7002	-0.2117
140.0	-3.6511	2.8278	-1.9889	4.9986	-2.1183	1.2222	-0.1714
150.0	-3.4166	1.8218	-1.2994	4.0996	-1.5252	0.7898	-0.1238
160.0	-2.8857	1.1309	-0.6714	3.1556	-0.9877	0.3534	-0.0764
170.0	-2.1438	0.5171	-0.2422	2.2070	-0.5537	0.0677	-0.0340
180.0	-1.9195	-0.0002	0.0002	1.9195	-0.2086	-0.0923	0.0000
190.0	-2.1351	-0.5131	0.2409	2.1978	0.1195	-0.2471	0.0347
200.0	-2.8867	-1.1258	0.6703	3.1550	0.4754	-0.5207	0.0790
210.0	-3.8205	-1.9172	1.2612	4.1019	0.9697	-0.8948	0.1291
220.0	-3.6550	-2.8231	1.9606	5.0000	1.5635	-1.3394	0.1798
230.0	-3.8930	-3.7195	2.6579	5.7366	2.1828	-1.7878	0.2243
240.0	-2.9768	-4.5248	3.2883	6.3207	2.7634	-2.1925	0.2579
250.0	-2.1587	-5.1451	3.7762	6.7228	3.2344	-2.4992	0.2754
260.0	-1.1303	-5.5259	4.0757	6.9448	3.5610	-2.6902	0.2769
270.0	-0.0007	-5.5748	4.1085	6.9114	3.6628	-2.7004	0.2653
280.0	1.1289	-5.5268	4.0765	6.9858	3.7156	-2.6807	0.2790
290.0	2.1486	-5.1190	3.7561	6.6884	3.5134	-2.4478	0.2884
300.0	2.9734	-4.5176	3.2835	6.3115	3.1827	-2.1232	0.2679
310.0	3.4915	-3.7163	2.6547	5.7321	2.6964	-1.6743	0.2249
320.0	3.6372	-2.8102	1.9475	4.9746	2.1258	-1.2198	0.1786
330.0	3.4086	-1.9118	1.2543	4.0870	1.5322	-0.7882	0.1281
340.0	2.8573	-1.1181	0.6627	3.1235	0.9873	-0.3469	0.0783
350.0	2.1086	-0.5091	0.2371	2.1707	0.5497	-0.0612	0.0344
360.0	1.9035	-0.0002	0.0003	1.9035	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000
10.0	2.0032	-0.4385	-0.2687	2.0574	-0.0795	0.2658	-0.0355
20.0	2.5926	0.9015	-0.7160	2.8220	-0.3555	0.5492	-0.0788
30.0	3.0479	1.4971	-1.3391	3.6335	-0.7324	0.9455	-0.1272
40.0	3.2172	2.1642	-2.0538	4.3699	-1.1756	1.4006	-0.1750
50.0	3.0600	2.8239	-2.7728	4.9844	-1.6377	1.8637	-0.2169
60.0	2.5978	3.4070	-3.4160	5.4617	-2.0568	2.2625	-0.2445
70.0	1.8761	3.8523	-3.9099	5.7830	-2.4064	2.5708	-0.2498
80.0	0.9789	4.1284	-4.2144	5.9625	-2.6519	2.7716	-0.2570
90.0	-0.0009	4.1552	-4.2437	5.9216	-2.7311	2.7883	-0.2506
100.0	-0.9764	4.1228	-4.2083	5.9540	-2.7691	2.7561	-0.2661
110.0	-1.8703	3.8501	-3.9058	5.7768	-2.6478	2.5482	-0.2615
120.0	-2.5757	3.3863	-3.3921	5.4243	-2.3862	2.1948	-0.2356
130.0	-3.0387	2.8092	-2.7538	4.9524	-2.0501	1.7714	-0.2043
140.0	-3.2151	2.1638	-2.0523	4.3674	-1.6577	1.2831	-0.1761
150.0	-3.0385	1.4956	-1.3356	3.6234	-1.2224	0.7967	-0.1279
160.0	-2.6221	0.9105	-0.7271	2.6546	-0.8280	0.3881	-0.0796
170.0	-2.0242	0.4407	-0.2719	2.0766	-0.4968	0.0864	-0.0358
180.0	-1.9115	-0.0002	0.0000	1.9115	-0.2086	-0.0926	0.0000
190.0	-1.9948	-0.4338	0.2664	2.0483	0.0713	-0.2640	0.0363
200.0	-2.6092	-0.9024	0.7209	2.8391	0.3469	-0.5533	0.0819
210.0	-3.0549	-1.4966	1.3429	3.6410	0.7188	-0.9466	0.1331
220.0	-3.2250	-2.1640	2.0587	4.3782	1.1605	-1.4030	0.1846
230.0	-3.0498	-2.8091	2.7607	4.9635	1.6146	-1.8560	0.2298
240.0	-2.5820	-3.3847	3.3934	5.4263	2.0390	-2.2596	0.2621
250.0	-1.8647	-3.8244	3.8806	5.7411	2.3873	-2.5626	0.2648
260.0	-0.9715	-4.0860	4.1648	5.8970	2.6207	-2.7442	0.2769
270.0	-0.0007	-4.1156	4.1949	5.8589	2.7035	-2.7570	0.2660
280.0	0.9683	-4.0786	4.1553	5.8846	2.7492	-2.7298	0.2800
290.0	1.8473	-3.7891	3.8387	5.6837	2.6129	-2.5020	0.2743
300.0	2.5690	-3.3668	3.3744	5.3973	2.3945	-2.1958	0.2472
310.0	3.0113	-2.7756	2.7207	4.8988	2.0453	-1.7527	0.2123
320.0	3.1899	-2.1426	2.0312	4.3289	1.6555	-1.2706	0.1822
330.0	3.0324	-1.4872	1.3299	3.6135	1.2273	-0.7932	0.1321
340.0	2.5803	-0.8955	0.7113	2.8079	0.8237	-0.3767	0.0810
350.0	1.9930	-0.4334	0.2660	2.0465	0.4935	-0.0800	0.0360
360.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000

TABLE II - SPACE OPERATIONS CENTER SECOND STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000
10.0	1.8704	0.3556	-0.2825	1.9153	-0.0331	0.2730	-0.0355
20.0	2.2657	0.6702	-0.5357	2.4586	-0.2236	0.5449	-0.0774
30.0	2.5871	1.0635	-0.8819	3.0614	-0.4758	0.9084	-0.1225
40.0	2.7044	1.5010	-1.9470	3.6378	-0.7711	1.3297	-0.1663
50.0	2.5463	1.9233	-2.6011	4.0989	-1.0696	1.7362	-0.2028
60.0	2.1428	2.2981	-3.1760	4.4458	-1.3501	2.1002	-0.2264
70.0	1.5222	2.5886	-3.5853	4.6362	-1.5761	2.3473	-0.2143
80.0	0.7850	2.7006	-3.8192	4.7233	-1.7242	2.5029	-0.2185
90.0	-0.0005	2.7193	-3.8517	4.6953	-1.7855	2.5273	-0.2171
100.0	-0.7789	2.6920	-3.8057	4.6465	-1.8161	2.4950	-0.2308
110.0	-1.5120	2.5487	-3.5683	4.4184	-1.7648	2.3438	-0.2183
120.0	-2.1107	2.2720	-3.1450	4.3978	-1.6267	2.0684	-0.1921
130.0	-2.5143	1.9073	-2.5730	4.0536	-1.4320	1.6643	-0.1885
140.0	-2.7021	1.5025	-1.9480	3.6372	-1.1931	1.2118	-0.1674
50.0	-2.6085	1.0721	-1.2958	3.0888	-0.9198	0.7696	-0.1232
0.0	-2.3218	0.6824	-0.7265	2.5137	-0.6613	0.3879	-0.0779
170.0	-1.8759	0.3559	-0.2844	1.9211	-0.4325	0.0926	-0.0360
180.0	-1.9129	-0.0004	0.0001	1.9129	-0.2084	-0.0926	0.0000
190.0	-1.8877	-0.3508	0.2781	1.8918	0.0268	-0.2703	0.0362
200.0	-2.3017	-0.6740	0.7174	2.4906	0.2182	-0.5500	0.0798
210.0	-2.6089	-1.0668	1.2932	3.0860	0.4688	-0.9152	0.1275
220.0	-2.6803	-1.4854	1.8295	3.6047	0.7506	-1.3144	0.1735
230.0	-2.5131	-1.8568	2.3663	4.0451	1.0450	-1.7112	0.2117
240.0	-2.1060	-2.2556	3.1201	4.3698	1.3192	-2.0613	0.2384
250.0	-1.5055	-2.5157	3.5312	4.5706	1.5449	-2.3199	0.2361
260.0	-0.7765	-2.6624	3.7552	4.6484	1.6981	-2.4684	0.2310
270.0	-0.0007	-2.6903	3.7968	4.6332	1.7663	-2.4924	0.2256
280.0	0.7760	-2.6622	3.7567	4.6495	1.8020	-2.4661	0.2389
290.0	1.4891	-2.4888	3.4897	4.5185	1.7314	-2.2771	0.2252
300.0	2.0856	-2.2311	3.0900	4.3264	1.6100	-2.0279	0.1920
310.0	2.4734	-1.8724	2.5226	3.9805	1.4134	-1.6217	0.1918
320.0	2.6574	-1.4758	1.9092	3.5727	1.1822	-1.1873	0.1710
330.0	2.5739	-1.0863	1.2731	3.0441	0.9164	-0.7551	0.1263
340.0	2.2564	-0.6650	0.7017	2.4419	0.6527	-0.3693	0.0790
350.0	1.8503	-0.3503	0.2781	1.8944	0.4298	-0.0869	0.0360
360.0	1.9037	-0.0003	0.0003	1.9037	0.2083	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0005	2.2929	0.3766	0.0922	0.0000
10.0	2.2481	0.3855	0.3406	2.2986	0.1165	-0.1198	0.0460
20.0	2.6310	0.7314	0.8241	2.8415	-0.0980	-0.4335	0.0997
30.0	2.9101	1.1489	1.4447	3.4329	-0.3732	-0.8449	0.1584
40.0	2.9746	1.6035	2.1432	3.9870	-0.6891	-1.3036	0.2170
50.0	2.7544	2.0358	2.8194	4.4205	-1.0183	-1.7566	0.2691
60.0	2.2984	2.4128	3.4156	4.7556	-1.3323	-2.1692	0.3105
70.0	1.6284	2.6810	3.8366	4.9388	-1.5817	-2.4342	0.3146
80.0	0.8467	2.8642	4.1262	5.0781	-1.7801	-2.6485	0.3381
90.0	0.0031	2.8742	4.1464	5.0280	-1.8559	-2.6670	0.3468
100.0	-0.8122	2.7866	3.9826	4.9097	-1.8765	-2.5871	0.3001
110.0	-1.6034	2.6477	3.7755	4.8649	-1.8594	-2.4733	0.2890
120.0	-2.2646	2.3912	3.3733	4.6473	-1.7605	-2.2525	0.2719
130.0	-2.7332	2.0247	2.8017	4.3909	-1.5877	-1.8528	0.2537
140.0	-2.9784	1.6044	2.1481	3.9929	-1.3665	-1.4208	0.2173
150.0	-2.9422	1.1600	1.4635	3.4717	-1.1064	-0.9944	0.1591
160.0	-2.6550	0.7364	0.8326	2.8675	-0.8403	-0.6013	0.1007
170.0	-2.2395	0.3855	0.3395	2.2898	-0.6066	-0.2984	0.0466
180.0	-2.3075	-0.0012	0.0001	2.3075	-0.3762	-0.0923	0.0000
190.0	-2.2424	-0.3836	-0.3389	2.2925	-0.1207	0.1216	-0.0468
200.0	-2.6449	-0.7429	-0.8279	2.8559	0.0934	0.4578	-0.1019
210.0	-2.9305	-1.1551	-1.4565	3.4576	0.3664	0.8517	-0.1632
220.0	-2.9802	-1.6074	-2.1493	3.9960	0.6866	1.3122	-0.2238
230.0	-2.7523	-2.0357	-2.8173	4.4179	1.0152	1.7616	-0.2775
240.0	-2.2970	-2.4118	-3.4086	4.7493	1.3235	2.1616	-0.3200
250.0	-1.6475	-2.7031	-3.8756	4.9858	1.5885	2.4713	-0.3402
260.0	-0.8472	-2.8573	-4.1156	5.0840	1.7696	2.6564	-0.3499
270.0	-0.0028	-2.8666	-4.1256	5.0061	1.8528	2.6547	-0.3531
280.0	0.8197	-2.7884	-3.9993	4.9262	1.8817	2.5900	-0.3263
290.0	1.6066	-2.6437	-3.7771	4.8654	1.8638	2.4651	-0.3056
300.0	2.2754	-2.3855	-3.3786	4.7045	1.7645	2.2247	-0.2716
310.0	2.7525	-2.0200	-2.7985	4.3851	1.5912	1.8461	-0.2557
320.0	2.9673	-1.5987	-2.1370	3.9764	1.3682	1.4135	-0.2206
330.0	2.9008	-1.1439	-1.4380	3.4207	1.0996	0.9748	-0.1615
340.0	2.6145	-0.7279	-0.8184	2.8264	0.8370	0.5912	-0.1011
350.0	2.2529	-0.3830	-0.5372	2.2829	0.6039	0.2965	-0.0465
360.0	2.2929	-0.0011	0.0005	2.2929	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000
10.0	2.3810	0.4770	0.3201	2.4406	0.0659	-0.1088	0.0390
20.0	2.9321	[illegible]	[illegible]	3.1[illegible]	-0.2356	-0.4293	0.0876
30.0	3.3364	1.5937	[illegible]	3.9[illegible]	-0.6394	-0.8653	0.1428
40.0	3.4490	2.2731	2.2035	4.6662	-1.1051	-1.3577	0.2000
50.0	3.2636	2.9623	2.9592	5.2929	-1.5944	-1.8590	0.2549
60.0	2.8806	3.5594	3.6235	5.7608	-2.0535	-2.3109	0.3008
70.0	1.9731	4.0013	4.1136	6.0528	-2.4187	-2.6343	0.3259
80.0	1.0294	4.2934	4.4393	6.2454	-2.6996	-2.8634	0.3522
90.0	0.0021	4.3056	4.4509	6.1770	-2.7898	-2.8758	0.3590
100.0	-1.0041	4.2195	4.3[illegible]	6.1194	-2.8238	-2.8212	[illegible]07
110.0	-1.9624	3.9873	4.0922	6.0252	-2.7535	-2.6568	[illegible]
120.0	-2.7189	3.5296	3.5848	5.7024	-2.5333	-2.3469	0.[illegible]
130.0	-3.2560	2.9591	2.9550	5.2839	-2.2246	-1.960[illegible]	0.[illegible]
140.0	-3.4640	2.2831	2.2136	4.[illegible]	-1.8318	-1.4694	[illegible].2016
150.0	-3.3368	1.5943	[illegible].4692	3.9649	-1.4068	-0.9992	0.1443
160.0	-2.9606	0.9815	0.8219	3.2132	-1.0164	-0.5999	0.0885
170.0	-2.3835	0.4762	0.3211	2.4431	-0.6762	-0.2891	0.0395
180.0	-2.3089	-0.0010	0.0002	2.3089	-0.3763	-0.0923	0.0000
190.0	-2.3795	-0.4751	-0.3183	2.4387	-0.0712	0.1098	-0.0397
200.0	-2.9484	-0.9761	-0.8164	3.1991	0.2314	0.4354	-0.0900
210.0	-3.3514	-1.5982	-1.4758	3.9813	0.6303	0.8698	-0.1485
220.0	-3.4850	-2.2934	-2.2270	4.7138	1.1015	1.3694	-0.2095
230.0	-3.2554	-2.9544	-2.9889	5.2777	1.5813	1.8573	-0.2657
240.0	-2.7536	-3.5615	-3.6272	5.7657	2.0438	2.3115	-0.3145
250.0	-1.9748	-4.0033	-4.1140	6.0549	2.4201	2.6422	-0.3348
260.0	-1.0302	-4.2878	-4.4314	6.2361	2.6[illegible]95	2.8562	-0.3676
270.0	-0.0026	-4.3059	-4.4480	6.1751	2.7[illegible]21	2.8744	-0.3666
280.0	1.0053	-4.2125	-4.3414	6.1162	2.8220	2.8163	-0.3449
290.0	1.9495	-3.9539	-4.0582	5.9762	2.7381	2.6378	-0.3304
300.0	2.7221	-3.5225	-3.5810	5.6975	2.5345	2.3395	-0.2962
310.0	3.2374	-2.9373	-2.9320	5.2477	2.2203	1.9387	-0.2462
320.0	3.4605	-2.2787	-2.2088	4.6799	1.8396	1.4675	-0.2066
330.0	3.3327	-1.5906	-1.4652	3.9585	1.4135	0.9976	-0.1475
340.0	2.9204	-0.9688	-0.8065	3.1685	1.0103	0.5858	-0.0895
350.0	2.3634	-0.4733	-0.3167	2.4224	0.6746	0.2845	-0.0395
360.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000
10.0	2.5010	0.5615	0.2613	2.5692	0.0184	-0.0852	0.0302
20.0	3.2226	1.2162	0.7500	3.5118	-0.3779	-0.3931	0.0706
30.0	3.7211	2.0443	1.3746	4.4473	-0.9110	-0.8084	0.1196
40.0	3.9173	2.9833	2.1055	5.3595	-1.5409	-1.2975	0.1726
50.0	3.7199	3.9178	2.8374	6.0872	-2.2009	-1.7920	0.2220
60.0	3.1504	4.7461	3.4890	6.6660	-2.8163	-2.2358	0.2649
70.0	2.2797	5.3849	3.9950	7.0690	-3.5143	-2.5771	0.2994
80.0	1.1467	5.7767	4.3016	7.2672	-3.6674	-2.7885	0.3237
90.0	0.0014	5.8004	4.3105	7.2139	-3.7802	-2.8025	0.3294
100.0	-1.1698	5.6987	4.2260	7.1772	-3.4066	-2.7576	0.2908
110.0	-2.2641	5.3636	3.9731	7.0351	-3.6714	-2.5812	0.3083
120.0	-3.1420	4.7386	3.4819	6.6528	-3.3445	-2.2714	0.2730
130.0	-3.7248	3.9241	2.8419	6.0963	-2.8801	-1.8718	0.2256
140.0	-3.9082	2.9789	2.0999	5.3282	-2.3098	-1.4053	0.1721
150.0	-3.7104	2.0400	1.3714	4.4354	-1.7169	-0.9454	0.1196
160.0	-3.2258	1.2179	0.7523	3.5158	-1.1797	-0.5565	0.0708
170.0	-2.5027	0.5604	0.2839	2.5709	-0.7351	-0.2668	0.0307
180.0	-2.3010	-0.0010	0.0000	2.3010	-0.3761	-0.0926	0.0000
190.0	-2.4916	-0.5587	-0.2801	2.5593	-0.0263	0.0866	-0.0311
200.0	-3.2026	-1.2072	-0.7424	3.4890	0.3670	0.3927	-0.0726
210.0	-3.7043	-2.0324	-1.3661	4.4255	0.8926	0.8059	-0.1247
220.0	-3.8924	-2.9626	-2.0886	5.3034	1.5163	1.2907	-0.1811
230.0	-3.6885	-3.8825	-2.8073	6.0315	2.1685	1.7793	-0.2342
240.0	-3.1256	-4.7012	-3.4542	6.6034	2.7762	2.2182	-0.2804
250.0	-2.2556	-5.3293	-3.9486	6.9927	3.2751	2.5540	-0.3184
260.0	-1.1770	-5.7072	-4.2473	7.1984	3.6241	2.7626	-0.3439
270.0	-0.0024	-5.7444	-4.2710	7.1457	3.7459	2.7765	-0.3456
280.0	1.1612	-5.6525	-4.1988	7.1237	3.7880	2.7444	-0.3235
290.0	2.2353	-5.2833	-3.9126	6.9309	3.6376	2.5520	-0.3255
300.0	3.1052	-4.6775	-3.4340	6.5671	3.3224	2.2451	-0.2888
310.0	3.6762	-3.8701	-2.7978	6.0116	2.8659	1.8497	-0.2329
320.0	3.8718	-2.9488	-2.0760	5.2756	2.3092	1.3953	-0.1789
330.0	3.6775	-2.0201	-1.3561	4.3943	1.7179	0.9375	-0.1238
340.0	3.1652	-1.1960	-0.7342	3.4491	1.1752	0.5449	-0.0724
350.0	2.4641	-0.5541	-0.2761	2.5312	0.7311	0.2587	-0.0306
360.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000
10.0	2.6003	0.6346	0.2289	2.6760	-0.0221	-0.0526	0.0202
20.0	3.4288	[illegible]	[illegible]	[illegible]	-0.4980	-0.3127	0.0500
30.0	4.0053	2.[illegible]	[illegible]	[illegible]	-1.1582	-0.6696	0.0879
40.0	4.2432	3.5890	1.7759	5.0190	-1.9240	-1.0904	0.1306
50.0	4.0505	4.7493	2.4072	6.0762	-2.7296	-1.5171	0.1716
60.0	3.4517	5.7940	2.9773	7.3605	-3.4861	-1.9074	0.2107
70.0	2.4974	6.5892	3.4133	7.0881	-4.0944	-2.2044	0.2413
80.0	1.3054	7.0765	3.6791	8.0735	-4.5185	-2.3905	0.2645
90.0	0.0011	7.1300	3.6997	8.0245	-4.6568	-2.4115	0.2739
100.0	-1.2962	7.0281	3.6429	8.0127	-4.6917	-2.3843	0.2424
110.0	-2.4812	6.5617	3.3942	7.7832	-4.4714	-2.2108	0.2550
120.0	-3.4342	5.7740	2.9648	7.3513	-4.0372	-1.9394	0.2201
130.0	-4.0453	4.7468	2.4048	6.6703	-3.4362	-1.5927	0.1755
140.0	-4.2276	3.5795	1.7692	5.7997	-2.7165	-1.1957	0.1299
150.0	-3.9978	2.4298	1.1517	4.8012	-1.9828	-0.8064	0.0853
160.0	-3.4112	1.4169	0.6208	3.7313	-1.3155	-0.4739	0.0500
170.0	-2.5989	0.6336	0.2301	2.6746	-0.7858	-0.2329	0.0206
180.0	-2.3024	-0.0012	0.0001	2.3024	-0.3762	-0.0926	0.0000
190.0	-2.5991	-0.6320	-0.2279	2.6744	0.0138	0.0536	-0.0209
200.0	-3.4231	-1.4153	-0.6180	3.7415	0.4863	0.3138	-0.0521
210.0	-4.9973	-2.4218	-1.1482	4.7975	1.1318	0.6696	-0.0924
220.0	-4.2279	-3.5692	-1.7654	5.7929	1.8958	1.0858	-0.1375
230.0	-4.0235	-4.7125	-2.3861	6.6264	2.6932	1.5085	-0.1824
240.0	-3.4137	-5.7258	-2.9385	7.2735	3.4336	1.8880	-0.2238
250.0	-2.4710	-6.5159	-3.3725	7.7322	4.0453	2.1842	-0.2570
260.0	-1.2923	-6.991[illegible]	-3.6322	7.9755	4.4633	2.3662	-0.2797
270.0	-0.0019	-7.0715	-3.6716	7.9598	4.6166	2.3933	-0.2853
280.0	1.2814	-6.9476	-3.6063	7.9235	4.6465	2.3618	-0.2643
290.0	2.4564	-6.4804	-3.3531	7.6892	4.4373	2.1919	-0.2708
300.0	3.3995	-5.7043	-2.9271	7.2454	4.0138	1.9176	-0.2376
310.0	4.0064	-4.6924	-2.3756	6.5980	3.4202	1.5769	-0.1855
320.0	4.2087	-3.5547	-1.7576	5.7676	2.7222	1.1924	-0.1356
330.0	3.9681	-2.4064	-1.1407	5.7636	1.9835	0.8020	-0.0910
340.0	3.3696	-1.3971	-0.6086	3.6843	1.3138	0.4662	-0.0514
350.0	2.5617	-0.6253	-0.2238	2.6362	0.7863	0.2270	-0.0205
360.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

e) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2930	-0.0011	0.0003	2.2930	0.5766	0.0922	0.0000
10.0	2.6442	0.6921	0.1022	2.7659	-0.0534	-0.0113	0.0092
20.0	3.5715	1.5786	0.4426	3.9152	-0.5944	-0.1998	0.0259
30.0	4.2462	2.7576	0.8357	5.1158	-1.3490	-0.4661	0.0497
40.0	4.8035	4.0548	1.2768	6.1495	-2.2275	-0.7729	0.0785
50.0	4.2758	5.3856	1.7594	7.0824	-3.1481	-1.0895	0.1083
60.0	3.6399	6.5797	2.1519	7.8118	-4.0026	-1.3763	0.1385
70.0	2.6337	7.4889	2.4656	8.3059	-4.6906	-1.5941	0.1613
80.0	1.3776	8.0405	2.6551	8.5741	-5.1595	-1.7240	0.1866
90.0	0.0004	8.1635	2.6935	8.5923	-5.3364	-1.7573	0.1919
100.0	-1.3744	8.0223	2.6450	8.5534	-5.3437	-1.7295	0.1753
110.0	-2.6190	7.4630	2.4514	8.2735	-5.0723	-1.6001	0.1768
120.0	-3.6166	6.5493	2.1380	7.7714	-4.5465	-1.4000	0.1512
130.0	-4.2352	5.3515	1.7251	7.0260	-3.8344	-1.1501	0.1120
140.0	-4.4502	4.0459	1.2751	6.1331	-3.0284	-0.8777	0.0780
150.0	-4.1817	2.7243	0.8249	5.0825	-2.1768	-0.5977	0.0491
160.0	-3.5367	1.5627	0.4415	3.8792	-1.4179	-0.3601	0.0261
170.0	-2.6751	0.6896	0.1608	2.7565	-0.8273	-0.1906	0.0092
180.0	-2.3024	-0.0012	0.0001	2.3024	-0.5762	-0.0926	0.0000
190.0	-2.6751	-0.6870	-0.1609	2.7541	0.0443	0.0114	-0.0097
200.0	-3.5454	-1.5765	-0.4423	3.9282	0.5816	0.2019	-0.0277
210.0	-4.2121	-2.7299	-0.8246	5.0710	1.5209	0.4643	-0.0532
220.0	-4.4604	-4.0404	-1.2737	6.1373	2.1973	0.7705	-0.0834
230.0	-4.2482	-5.3484	-1.7235	7.0322	3.1034	1.0805	-0.1150
240.0	-3.6119	-6.5204	-2.1249	7.7450	3.9443	1.3648	-0.1475
250.0	-2.6183	-7.4354	-2.4452	8.2469	4.6482	1.5859	-0.1731
260.0	-1.3754	-8.0036	-2.6421	8.5353	5.1297	1.7253	-0.1955
270.0	-0.0013	-8.1544	-2.6849	8.5826	5.3354	1.7576	-0.2065
280.0	1.3703	-7.9834	-2.6345	8.5132	5.3352	1.7274	-0.1905
290.0	2.6115	-7.4161	-2.4369	8.2249	5.0659	1.5985	-0.1906
300.0	3.6043	-6.5073	-2.1232	7.7268	4.5544	1.4001	-0.1598
310.0	4.2368	-5.3357	-1.7163	7.0156	3.8519	1.1504	-0.1206
320.0	4.4382	-4.0227	-1.2662	6.1083	3.0315	0.8749	-0.0816
330.0	4.1588	-2.6984	-0.8149	5.0087	2.1813	0.5926	-0.0517
340.0	3.5298	-1.5577	-0.4367	3.8665	1.4228	0.3562	-0.0271
350.0	2.6378	-0.6804	-0.1575	2.7181	0.8214	0.1863	-0.0094
360.0	2.2930	-0.0011	0.0003	2.2930	0.5766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000
10.0	2.7291	0.7267	0.0844	2.8144	-0.0735	0.0366	-0.0024
20.0	3.6928	1.6914	0.2329	4.0536	-0.6505	-0.0659	0.0000
30.0	4.3695	2.9521	0.4384	5.2757	-1.4722	-0.2117	0.0080
40.0	4.6072	4.3593	0.6712	6.3636	-2.4216	-0.3743	0.0200
50.0	4.3907	5.7788	0.9102	7.3028	-3.4149	-0.5536	0.0365
60.0	3.7434	7.0664	1.1285	8.0688	-4.3365	-0.7132	0.0575
70.0	2.7055	8.0410	1.2934	8.5774	-5.0634	-0.8311	0.0724
80.0	1.4223	8.6776	1.3999	8.9022	-5.5897	-0.9113	0.0896
90.0	-0.0007	8.8283	1.4200	8.9406	-5.7767	-0.9268	0.0973
100.0	-1.4227	8.6738	1.3960	8.8978	-5.7849	-0.9170	0.0856
110.0	-2.7013	8.0443	1.2909	8.5787	-5.4600	-0.8499	0.0807
120.0	-3.7245	7.0461	1.1236	8.0405	-4.8769	-0.7510	0.0591
130.0	-4.3732	5.7671	0.9083	7.2824	-4.1049	-0.6271	0.0364
140.0	-4.5463	4.3188	0.6676	6.2908	-3.1923	-0.4848	0.0203
150.0	-4.3040	2.9191	0.4352	5.2028	-2.3004	-0.3466	0.0091
160.0	-3.6457	1.6756	0.2323	4.0040	-1.4945	-0.2276	0.0007
170.0	-2.7312	0.7270	0.0343	2.8165	-0.8535	-0.1429	-0.0025
180.0	-2.3050	-0.0013	0.0001	2.3050	-0.3761	-0.0924	0.0000
190.0	-2.7306	-0.7241	-0.0846	2.8154	0.0641	-0.0365	0.0022
200.0	-3.6872	-1.6834	-0.2322	4.0456	0.6436	0.0675	-0.0010
210.0	-4.3719	-2.9440	-0.4358	5.2736	1.4540	0.2124	-0.0095
220.0	-4.6070	-4.3462	-0.6664	6.3547	2.3973	0.3799	-0.0233
230.0	-4.3844	-5.7538	-0.9013	7.2787	3.3821	0.5503	-0.0392
240.0	-3.7273	-7.0190	-1.1167	8.0177	4.2913	0.7066	-0.0590
250.0	-2.7049	-8.0169	-1.2864	8.5557	5.0423	0.8295	-0.0770
260.0	-1.4236	-8.6873	-1.3918	8.8715	5.5595	0.9072	-0.0955
270.0	-0.0010	-8.8445	-1.4231	8.9572	5.7452	0.9310	-0.1086
280.0	1.4217	-8.6397	-1.3906	8.8637	5.7711	0.9146	-0.0936
290.0	2.6991	-8.0008	-1.2829	8.5364	5.4528	0.8495	-0.0836
300.0	3.7064	-6.9809	-1.1101	7.9738	4.8607	0.7436	-0.0649
310.0	4.3487	-5.7049	-0.8956	7.2218	4.0859	0.6185	-0.0399
320.0	4.5460	-4.2936	-0.6601	6.2739	3.1993	0.4804	-0.0218
330.0	4.2689	-2.8807	-0.4240	5.1522	2.2966	0.3395	-0.0094
340.0	3.6199	-1.6561	-0.2270	3.9729	1.4895	0.2236	-0.0008
350.0	2.6858	-0.7154	-0.0825	2.7697	0.8867	0.1411	0.0024
360.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000
10.0	2.7558	0.7413	0.0003	2.8426	-0.0811	0.0897	-0.0141
20.0	3.3439	1.7348	0.0000	4.1114	-0.6833	0.0825	-0.0267
30.0	4.0137	3.9205	0.0006	5.3325	-1.5146	0.0701	-0.0359
40.0	4.6511	4.4623	-0.0001	6.4312	-2.4925	0.0569	-0.0413
50.0	4.4360	5.9205	-0.0001	7.3866	-3.5123	0.0413	-0.0413
60.0	3.7669	7.2203	-0.0003	8.1363	-4.4604	0.0253	-0.0344
70.0	2.7217	8.2091	0.0000	8.6447	-5.1944	0.0126	-0.0238
80.0	1.4247	8.8178	0.0000	8.9311	-5.6902	0.0044	-0.0116
90.0	-0.0037	9.0936	0.0000	9.0936	-5.9659	0.0000	0.0000
100.0	-1.4295	8.8378	-0.0016	8.9512	-5.8949	-0.0038	-0.0130
110.0	-2.7186	8.2207	-0.0001	8.6546	-5.5809	-0.0140	-0.0266
120.0	-3.7298	7.1703	-0.0003	8.0744	-4.9476	-0.0258	-0.0342
130.0	-4.3868	5.8788	0.0004	7.3230	-4.1604	-0.0390	-0.0384
140.0	-4.5761	4.4131	-0.0004	6.3420	-3.2407	-0.0565	-0.0407
150.0	-4.3396	2.9836	-0.0001	5.2502	-2.3443	-0.0708	-0.0360
160.0	-3.6711	1.7087	0.0000	4.0341	-1.5119	-0.0820	-0.0265
170.0	-2.7424	0.7392	0.0003	2.8291	-0.8604	-0.0897	-0.0141
180.0	-2.3050	-0.0013	-0.0001	2.3050	-0.3761	-0.0924	0.0000
190.0	-2.7558	-0.7378	0.0000	2.8420	0.0723	-0.0898	0.0142
200.0	-3.7355	-1.7248	-0.0001	4.1001	0.6694	-0.0823	0.0267
210.0	-4.4300	-3.0201	-0.0003	5.3465	1.5021	-0.0708	0.0361
220.0	-4.6635	-4.4585	0.0001	6.4383	2.4681	-0.0563	0.0407
230.0	-4.4340	-5.8985	0.0000	7.3685	3.4776	-0.0409	0.0407
240.0	-3.7569	-7.1752	-0.0001	8.0933	4.4061	-0.0249	0.0341
250.0	-2.7240	-8.1844	0.0003	8.6225	5.1627	-0.0135	0.0249
260.0	-1.4340	-8.8184	0.0006	8.9333	5.6824	-0.0043	0.0115
270.0	-0.0006	-9.1142	0.0000	9.1142	5.9734	0.0000	0.0000
280.0	1.4367	-8.8367	0.0001	8.9519	5.9013	0.0044	0.0122
290.0	2.7218	-8.1777	0.0000	8.6154	5.5662	0.0125	0.0237
300.0	3.7308	-7.1238	0.0000	8.0348	4.9504	0.0249	0.0338
310.0	4.3755	-5.8252	-0.0001	7.2748	4.1503	0.0411	0.0409
320.0	4.5708	-4.3758	-0.0001	6.3140	3.2426	0.0566	0.0410
330.0	4.3243	-2.9528	-0.0001	5.2212	2.3429	0.0708	0.0360
340.0	3.6461	-1.6896	0.0000	4.0041	1.5140	0.0822	0.0266
350.0	2.7073	-0.7287	0.0003	2.7926	0.8559	0.0900	0.0142
360.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000

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TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

h) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000
10.0	2.7425	0.7291	-0.0846	2.8281	-0.0735	0.1432	-0.0255
20.0	3.6930	1.6910	-0.2328	4.0536	-0.6574	0.2308	-0.0527
30.0	4.3723	2.9537	-0.4377	5.2788	-1.4720	0.3530	-0.0790
40.0	4.6015	4.3544	-0.6703	6.3560	-2.4220	0.4921	-0.1006
50.0	4.3931	5.7817	-0.9096	7.3064	-3.4164	0.6749	-0.1166
60.0	3.7448	7.0883	-1.1275	8.0701	-4.3371	0.7623	-0.1238
70.0	2.7016	8.0312	-1.2911	8.5667	-5.0607	0.8572	-0.1221
80.0	1.4214	8.5718	-1.3986	8.8961	-5.5871	0.9194	-0.1126
90.0	-0.0022	8.8369	-1.4219	8.9493	-5.7843	0.9278	-0.0983
100.0	-1.4261	8.6938	-1.4014	8.9180	-5.7951	0.9110	-0.1113
110.0	-2.7025	8.0524	-1.2934	8.5871	-5.4654	0.8250	-0.1316
120.0	-3.7189	7.0396	-1.1214	8.0318	-4.8737	0.6989	-0.1272
130.0	-4.3733	5.7691	-0.9087	7.2840	-4.1053	0.5473	-0.1152
140.0	-4.5556	4.3273	-0.6692	6.3035	-3.1976	0.3729	-0.1012
150.0	-4.3107	2.9233	-0.4369	5.2105	-2.3084	0.2065	-0.0801
160.0	-3.6436	1.6756	-0.2326	4.0020	-1.4934	0.0643	-0.0528
170.0	-2.7255	0.7266	-0.0849	2.8109	-0.8512	-0.0377	-0.0258
180.0	-2.3050	-0.0013	0.0001	2.3050	-0.3761	-0.0924	0.0000
190.0	-2.7312	-0.7246	0.0842	2.8162	0.0639	-0.1428	0.0258
200.0	-3.6927	-1.5850	0.2326	4.0518	0.6442	-0.2323	0.0536
210.0	-4.3672	-2.9412	0.4349	5.2681	1.4516	-0.3541	0.0807
220.0	-4.6074	-4.3860	0.6668	6.3549	2.3970	-0.4926	0.1037
230.0	-4.3828	-5.7511	0.9005	7.2756	3.3796	-0.6318	0.1197
240.0	-3.7242	-7.0125	1.1150	8.0104	4.2870	-0.7554	0.1260
250.0	-2.7028	-8.0122	1.2851	8.5486	5.0382	-0.8552	0.1268
260.0	-1.4237	-8.6485	1.3920	8.8729	5.5596	-0.9157	0.1183
270.0	-0.0006	-8.8528	1.4245	8.9656	5.7993	-0.9317	0.1091
280.0	1.4239	-8.6527	1.3929	8.8771	5.7759	-0.9065	0.1179
290.0	2.7015	-8.0064	1.2846	8.5427	5.4559	-0.8235	0.1328
300.0	3.7111	-6.9879	1.1124	7.9825	4.8626	-0.6951	0.1306
310.0	4.3525	-5.7139	0.8971	7.2275	4.0868	-0.5371	0.1201
320.0	4.5876	-4.2985	0.6597	6.2757	3.1985	-0.3671	0.1021
330.0	4.2696	-2.8814	0.4256	5.1532	2.2958	-0.1993	0.0795
340.0	3.6145	-1.6544	0.2266	3.9672	1.4882	-0.0591	0.0531
350.0	2.6931	-0.7167	0.0826	2.7772	0.8480	0.0393	0.0256
360.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 ℓ_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000
10.0	2.6783	0.6908	-0.1618	2.7599	-0.0542	0.1916	-0.0360
20.0	3.5691	1.5774	-0.4420	3.9125	-0.5938	0.3444	-0.0761
30.0	4.2336	2.7504	-0.8329	5.1010	-1.3478	0.6066	-0.1171
40.0	4.4644	4.0542	-1.2788	6.1497	-2.2258	0.8857	-0.1558
50.0	4.2663	5.3834	-1.7368	7.0738	-3.1451	1.1702	-0.1855
60.0	3.6361	6.5734	-2.1484	7.8037	-3.9993	1.4241	-0.2018
70.0	2.6315	7.4832	-2.4625	8.2991	-4.6866	1.6185	-0.2085
80.0	1.3788	8.0465	-2.6573	8.5806	-5.1614	1.7384	-0.2042
90.0	-0.0017	8.1627	-2.6928	8.5913	-5.3339	1.7553	-0.1930
100.0	-1.3782	8.0408	-2.6540	8.5742	-5.3556	1.7262	-0.2006
110.0	-2.6199	7.4712	-2.4559	8.2824	-5.0807	1.5793	-0.2228
120.0	-3.6119	6.5425	-2.1349	7.7625	-4.5456	1.3516	-0.2115
130.0	-4.2466	5.3665	-1.7292	7.0457	-3.8441	1.0722	-0.1889
140.0	-4.4669	4.0610	-1.2814	6.1564	-3.0376	0.7683	-0.1555
150.0	-4.1931	2.7315	-0.8282	5.0564	-2.1853	0.4589	-0.1169
160.0	-3.5408	1.5703	-0.4423	3.8837	-1.4196	0.1969	-0.0761
170.0	-2.6796	0.6911	-0.1625	2.7613	-0.8276	0.0111	-0.0362
180.0	-2.3075	-0.0012	0.0001	2.3075	-0.5762	-0.0923	0.0000
190.0	-2.6802	-0.6887	0.1604	2.7614	0.0460	-0.1916	0.0364
200.0	-3.5943	-1.5808	0.4457	3.9375	0.5837	-0.3680	0.0760
210.0	-4.2260	-2.7371	0.8279	5.0874	1.5259	-0.6079	0.1209
220.0	-4.4713	-4.0496	1.2774	6.1520	2.2031	-0.8854	0.1604
230.0	-4.2515	-5.3520	1.7245	7.0372	3.1084	-1.1643	0.1924
240.0	-3.6116	-6.5192	2.1289	7.7416	3.9526	-1.4148	0.2120
250.0	-2.6222	-7.4457	2.4481	8.2583	4.6531	-1.6120	0.2214
260.0	-1.3760	-8.0063	2.6430	8.5382	5.1300	-1.7320	0.2174
270.0	-0.0006	-8.1604	2.6920	8.5890	5.3352	-1.7576	0.2083
280.0	1.3740	-8.0042	2.6415	8.5353	5.3446	-1.7215	0.2151
290.0	2.6131	-7.4196	2.4391	8.2292	5.0647	-1.5726	0.2361
300.0	3.6095	-6.5145	2.1276	7.7364	4.5556	-1.3529	0.2215
310.0	4.2443	-5.3418	1.7216	7.0244	3.8533	-1.0718	0.1966
320.0	4.4397	-4.0236	1.2684	6.1101	3.0300	-0.7624	0.1578
330.0	4.1755	-2.7060	0.8193	5.0258	2.1857	-0.5 4	0.1189
340.0	3.5257	-1.5555	0.4350	3.8620	1.4207	-0.1917	0.0768
350.0	2.6359	-0.6806	0.1571	2.7161	0.8209	-0.0057	0.03
360.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000
10.0	2.6013	0.6346	-0.2289	2.6776	-0.0226	0.2334	-0.0449
20.0	3.4300	1.4212	-0.6206	3.7581	-0.4992	0.4771	-0.0962
30.0	4.0079	2.4331	-1.1545	4.8130	-1.1526	0.8134	-0.1509
40.0	4.2376	3.5838	-1.7731	5.8109	-1.9220	1.2021	-0.2014
50.0	4.0344	4.7315	-2.3973	6.6503	-2.7198	1.5934	-0.2422
60.0	3.4436	5.7818	-2.9699	7.3480	-3.4816	1.9540	-0.2693
70.0	2.4907	6.5724	-3.4032	7.7994	-4.0890	2.2269	-0.2849
80.0	1.2958	7.0249	-3.6502	8.0135	-4.4786	2.3775	-0.2845
90.0	-0.0017	7.1092	-3.6886	8.0009	-4.6416	2.4031	-0.2755
100.0	-1.2896	7.0118	-3.6385	7.9952	-4.6646	2.3623	-0.2705
110.0	-2.4728	6.5431	-3.3830	7.7599	-4.4596	2.1797	-0.2925
120.0	-3.4117	5.7408	-2.9434	7.2859	-4.0046	1.8703	-0.2763
130.0	-4.0302	4.7315	-2.3944	6.6465	-3.4220	1.4995	-0.2475
140.0	-4.2323	3.5840	-1.7710	5.8068	-2.7190	1.0842	-0.2004
150.0	-4.0010	2.4322	-1.1527	4.8063	-1.9845	0.6665	-0.1500
160.0	-3.3979	1.4122	-0.6186	3.7170	-1.3116	0.3080	-0.0960
170.0	-2.5998	0.6338	-0.2301	2.6756	-0.7857	0.0530	-0.0452
180.0	-2.3075	-0.0012	0.0001	2.3075	-0.3762	-0.0923	0.0000
190.0	-2.5943	-0.6310	0.2267	2.6694	0.0144	-0.2336	0.0455
200.0	-3.4260	-1.4153	0.6183	3.7444	0.4870	-0.4794	0.0984
210.0	-4.0093	-2.4282	1.1523	4.8117	1.1345	-0.8131	0.1547
220.0	-4.2385	-3.5777	1.7707	5.8075	1.9001	-1.2012	0.2083
230.0	-4.0250	-4.7138	2.3867	6.6285	2.6937	-1.5906	0.2534
240.0	-3.4150	-5.7282	2.9398	7.2766	3.4353	-1.9389	0.2830
250.0	-2.4734	-6.5219	3.3742	7.7368	4.0482	-2.2121	0.3018
260.0	-1.2951	-7.0048	3.6386	7.9906	4.4710	-2.3793	0.3027
270.0	-0.0008	-7.0993	3.6852	7.9908	4.6354	-2.4022	0.2902
280.0	1.2874	-6.9778	3.6212	7.9576	4.6668	-2.3611	0.2930
290.0	2.4533	-6.4722	3.3460	7.6782	4.4354	-2.1650	0.3086
300.0	3.4068	-5.7140	2.9530	7.2588	4.0234	-1.8746	0.2945
310.0	4.0185	-4.7035	2.3822	6.6157	3.4281	-1.5000	0.2556
320.0	4.2110	-3.5550	1.7576	5.7696	2.7218	-1.0791	0.2063
330.0	3.9722	-2.4077	1.1421	4.7680	1.9843	-0.6621	0.1528
340.0	3.3774	-1.3996	0.6102	3.6926	1.3139	-0.3025	0.0973
350.0	2.5550	-0.6246	0.2229	2.6294	0.7809	-0.0460	0.0451
360.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000
10.0	2.4982	0.5609	-0.2818	2.5662	0.0184	0.2655	-0.0519
20.0	3.2099	1.2120	-0.7457	3.4878	-0.3766	0.5553	-0.1112
30.0	3.7162	2.0410	-1.3729	4.4412	-0.9107	0.9507	-0.1749
40.0	3.9037	2.9740	-2.0972	5.3212	-1.5409	1.4096	-0.2349
50.0	3.7084	3.9063	-2.8269	6.0679	-2.1982	1.8708	-0.2841
60.0	3.1491	4.7830	-3.4876	6.6625	-2.8146	2.2680	-0.3208
70.0	2.2676	5.3597	-3.9723	7.0330	-3.2999	2.5674	-0.3331
80.0	1.1830	5.7516	-4.2817	7.2546	-3.6512	2.7844	-0.3405
90.0	-0.0018	5.7767	-4.2929	7.1844	-3.7580	2.7839	-0.3313
100.0	-1.1663	5.7077	-4.2406	7.1830	-3.8008	2.7464	-0.3227
110.0	-2.2533	5.3411	-3.9544	7.0039	-3.6553	2.5439	-0.3408
120.0	-3.1149	4.7045	-3.4509	6.5994	-3.3096	2.1898	-0.3241
130.0	-3.6978	3.9006	-2.8179	6.0532	-2.8570	1.7733	-0.2806
140.0	-3.9015	2.9755	-2.0948	5.3193	-2.3036	1.2877	-0.2335
150.0	-3.7064	2.0387	-1.3696	4.4309	-1.7142	0.8019	-0.1742
160.0	-3.2095	1.2123	-0.7477	3.4980	-1.1749	0.3897	-0.1111
170.0	-2.5023	0.5605	-0.2837	2.5705	-0.7346	0.0866	-0.0524
180.0	-2.3089	-0.0010	0.0002	2.3089	-0.3763	-0.0923	0.0000
190.0	-2.4974	-0.5591	0.2808	2.5652	-0.0251	-0.2677	0.0529
200.0	-3.2099	-1.2081	0.7438	3.4964	0.3672	-0.5594	0.1139
210.0	-3.7094	-2.0339	1.3695	4.4316	0.8941	-0.9502	0.1800
220.0	-3.9063	-2.9714	2.0975	5.3220	1.5208	-1.4082	0.2435
230.0	-3.6977	-3.8902	2.8149	6.0456	2.1727	-1.8658	0.2971
240.0	-3.1301	-4.7109	3.4616	6.6172	2.7845	-2.2773	0.3369
250.0	-2.2618	-5.3413	3.9584	7.0094	3.2835	-2.5886	0.3590
260.0	-1.1806	-5.7214	4.2585	7.2168	3.6335	-2.7798	0.3647
270.0	-0.0008	-5.7733	4.2941	7.1828	3.7599	-2.7910	0.3514
280.0	1.1678	-5.6862	4.2260	7.1675	3.8083	-2.7514	0.3477
290.0	2.2208	-5.2584	3.8890	6.8937	3.6169	-2.5151	0.3492
300.0	3.1166	-4.6911	3.4469	6.5891	3.3320	-2.2028	0.3415
310.0	3.6860	-3.8794	2.8062	6.0288	2.8660	-1.7701	0.2950
320.0	3.8855	-2.9568	2.0831	5.2929	2.3114	-1.2850	0.2411
330.0	3.6960	-2.0285	1.3659	4.4178	1.7226	-0.8009	0.1786
340.0	3.1787	-1.1999	0.7376	3.4654	1.1743	-0.3818	0.1130
350.0	2.4568	-0.5531	0.2752	2.5237	0.7294	-0.0776	0.0523
360.0	2.2929	-0.0011	0.0003	2.2929	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000
10.0	2.3791	[illegible]	-0.3194	[illegible]	0.0658	0.2909	-0.0574
20.0	2.9378	[illegible]	-0.8138	[illegible]	-0.2381	0.5982	-0.1219
30.0	3.3615	1.6048	-1.4804	3.9939	-0.6471	1.0160	-0.1895
40.0	3.4909	2.3008	-2.2314	4.7234	-1.1220	1.4843	-0.2531
50.0	3.2829	[illegible]	-2.9767	[illegible]	-1.6167	1.9637	-0.3064
60.0	2.7688	[illegible]	-3.6453	[illegible]	-2.0645	2.3749	-0.3447
70.0	1.9911	4.0393	-4.1520	6.1095	-2.4474	2.6892	-0.3558
80.0	1.0337	4.3172	-4.4599	6.3768	-2.7201	2.8920	-0.3650
90.0	-0.0014	4.3485	-4.4948	6.2382	-2.8254	2.9107	-0.3606
100.0	-1.0125	4.2602	-4.3994	6.1078	-2.8511	2.8444	-0.3455
110.0	-1.9403	3.9606	-4.0430	5.9662	-2.7317	2.6179	-0.3147
120.0	-2.7298	3.5464	-3.5958	5.7245	-2.5320	2.2918	-0.2762
130.0	-3.2551	[illegible]	-2.9495	5.2813	-2.2202	1.8671	-0.2910
140.0	-3.479.	[illegible]	-2.2224	4.7875	-1.8390	1.3655	-0.2526
150.0	-3.3481	1.6007	-1.4738	3.9785	-1.4111	0.8634	-0.1893
160.0	-2.9582	0.9815	-0.8221	3.2109	-1.0138	0.4335	-0.1222
170.0	-2.3917	[illegible]	-0.3256	2.4518	-0.6753	0.1093	-0.0576
180.0	-2.3018	[illegible]	0.0000	2.3018	-0.3763	-0.0926	0.0000
190.0	-2.3637	-0.4731	0.3152	2.4225	-0.0723	-0.2887	0.0581
200.0	-2.9453	-0.8747	0.8146	3.1954	0.2302	-0.6009	0.1247
210.0	-3.3596	[illegible]	1.4773	3.9859	0.6316	-1.0141	0.1950
220.0	-3.4896	[illegible]	2.2387	4.7185	1.1048	-1.4881	0.2627
230.0	-3.2697	-2.9645	2.9611	5.2990	1.5921	-1.9551	0.3201
240.0	-2.7532	-3.5611	3.6223	5.7620	2.0493	-2.3712	0.3631
250.0	-1.9813	-4.0121	4.1240	6.0696	2.4281	-2.6818	0.3720
260.0	-1.0264	-4.2758	4.4092	6.2108	2.6879	-2.8624	0.3877
270.0	-0.0005	-4.3120	4.4498	6.1804	2.7995	-2.8814	0.3780
280.0	1.0027	-4.2259	4.3582	6.1317	2.8360	-2.8228	0.3643
290.0	1.9160	-3.9077	3.9990	5.8942	2.7038	-2.5867	0.3409
300.0	2.7219	-3.5226	3.5797	5.6966	2.5397	-2.2962	0.3394
310.0	3.2235	[illegible]	2.9151	5.2229	2.2136	-1.8470	0.2996
320.0	3.4520	[illegible]	2.2818	4.6673	1.8388	-1.3533	0.2588
330.0	3.3363	-1.5916	1.4663	3.9624	1.4160	-0.8593	0.1927
340.0	2.9160	-0.9685	0.8058	3.1641	1.0109	-0.4221	0.1237
350.0	2.3462	-0.4708	[illegible]	2.4047	0.6714	-0.1009	0.0576
360.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000

TABLE III - SPACE OPERATIONS CENTER THIRD STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000
10.0	2.2491	0.3853	-0.3400	2.2994	0.1159	0.3013	-0.0603
20.0	2.6190	0.7290	-0.8203	2.8287	-0.0989	0.6016	-0.1267
30.0	2.9172	1.1517	-1.4485	3.4414	-0.3767	0.9914	-0.1943
40.0	2.9940	1.6137	-2.1578	4.0133	-0.7018	1.4330	-0.2568
50.0	2.7823	2.0545	-2.8473	4.4641	-1.0320	1.8570	-0.3090
60.0	2.3292	2.4405	-3.4564	4.8136	-1.3040	2.2368	-0.3460
70.0	1.6415	2.7018	-3.8680	4.9785	-1.5987	2.4864	-0.3382
80.0	0.8436	2.8581	-4.1124	5.0610	-1.7751	2.6458	-0.3471
90.0	-0.0011	2.8653	-4.1613	5.0463	-1.8603	2.6777	-0.3508
100.0	-0.8239	2.8273	-4.0581	4.9962	-1.8980	2.6136	-0.3343
110.0	-1.6076	2.6588	-3.7852	4.8794	-1.8653	2.4525	-0.3114
120.0	-2.2551	2.3832	-3.3483	4.6707	-1.7466	2.1729	-0.2805
130.0	-2.7419	2.0330	-2.8098	4.4052	-1.5929	1.7790	-0.2926
140.0	-2.9816	1.6101	-2.1507	3.9987	-1.3682	1.3103	-0.2564
150.0	-2.9241	1.1548	-1.4538	3.4505	-1.1004	0.8467	-0.1935
160.0	-2.6710	0.7400	-0.8382	2.8847	-0.8424	0.4414	-0.1269
170.0	-2.2453	0.3848	-0.3411	2.2959	-0.6087	0.1194	-0.0607
180.0	-2.3024	-0.0012	0.0001	2.3024	-0.5762	-0.0926	0.0000
190.0	-2.2197	-0.3815	0.3338	2.2693	-0.1217	-0.2984	0.0609
200.0	-2.6455	-0.7323	0.8272	2.8562	0.0938	-0.6045	0.1287
210.0	-2.9288	-1.1538	1.4544	3.4546	0.3696	-0.9949	0.1988
220.0	-2.9651	-1.5974	2.1367	3.9781	0.6806	-1.4164	0.2642
230.0	-2.7485	-2.0306	2.8122	4.4101	1.0068	-1.8306	0.3180
240.0	-2.2912	-2.4053	3.3991	4.7364	1.3119	-2.1967	0.3585
250.0	-1.6246	-2.6659	3.8087	4.9077	1.5660	-2.4566	0.3604
260.0	-0.8331	-2.8174	4.0404	4.9778	1.7474	-2.6061	0.3586
270.0	0.0004	-2.8578	4.1087	4.9871	1.8478	-2.6437	0.3603
280.0	0.8173	-2.7877	3.9987	4.9249	1.8793	-2.5835	0.3372
290.0	1.5596	-2.5862	3.6782	4.7417	1.8137	-2.3759	0.3074
300.0	2.2294	-2.3443	3.3102	4.6138	1.7343	-2.1403	0.2907
310.0	2.6926	-1.9935	2.7533	4.3208	1.5712	-1.7347	0.2947
320.0	2.9294	-1.5819	2.1079	3.9258	1.3564	-1.2839	0.2602
330.0	2.8883	-1.1397	1.4520	3.4063	1.0986	-0.8328	0.1971
340.0	2.6043	-0.7243	0.8130	2.8119	0.8352	-0.4236	0.1279
350.0	2.2117	-0.3806	0.3328	2.2611	0.6058	-0.1120	0.0606
360.0	2.2930	-0.0011	0.0003	2.2930	0.3766	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_B	C_m	C_n	C_ℓ
0.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000
10.0	2.3589	0.3952	0.3676	2.4126	0.1547	-0.1509	0.0580
20.0	2.7667	[illegible]	[illegible]	[illegible]	[illegible]	-0.4885	0.1250
30.0	3.1383	[illegible]	[illegible]	[illegible]	[illegible]	-0.9558	0.2153
40.0	3.2017	1.6923	2.3166	4.2861	-0.6646	-1.4529	0.2943
50.0	2.9815	2.1612	3.0557	4.7713	-1.0226	-1.9531	0.3731
60.0	2.4423	[illegible]	3.6185	[illegible]	-1.3548	-2.3317	0.3988
70.0	1.7837	[illegible]	4.0530	[illegible]	-1.6363	-2.6105	0.4075
80.0	0.8917	2.9995	4.3807	5.3678	-1.8762	-2.8620	0.4416
90.0	0.0037	3.0402	4.4560	5.3791	-1.9935	-2.9239	0.4805
100.0	-0.8708	[illegible]	4.2759	5.2475	-2.0326	-2.8301	0.4287
110.0	-1.7215	[illegible]	4.0561	5.2043	-2.0356	-2.7042	0.4126
120.0	-2.4502	2.5416	3.6534	5.0656	-1.9645	-2.4645	0.3915
130.0	-2.9692	2.1559	3.0478	4.7562	-1.7980	-2.0559	0.3599
140.0	-3.3163	[illegible]	2.3300	4.3067	-1.5506	-1.5755	0.2960
150.0	-3.1856	[illegible]	1.5968	3.7569	-1.2714	-1.1078	0.2175
160.0	-2.8028	0.7633	0.8916	3.0284	-0.9336	-0.6587	0.1267
170.0	-2.3585	0.3941	0.3673	2.4121	-0.6712	-0.3229	0.0587
180.0	-2.3087	[illegible]	0.0001	2.3087	-0.3764	-0.0923	0.0000
190.0	-2.3583	[illegible]	-0.3665	2.4119	-0.1593	0.1459	-0.0588
200.0	-2.7883	-0.7594	-0.8855	3.0123	0.0547	0.4949	-0.1280
210.0	-3.1596	-1.2181	-1.5826	3.7260	0.3200	0.9595	-0.2194
220.0	-3.2007	-1.6947	-2.3193	4.2876	0.6613	1.4577	-0.3007
230.0	-2.9714	[illegible]	-3.0478	4.7580	1.0167	1.9520	-0.3804
240.0	-2.4406	-2.5282	-3.6284	5.0363	1.3523	2.3387	-0.4187
250.0	-1.7393	-2.8206	-4.0969	5.2541	1.6450	2.6557	-0.4383
260.0	-0.8956	-2.9924	-4.3741	5.3594	1.8627	2.8542	-0.4559
270.0	-0.0039	-3.0341	-4.4375	5.3599	1.9917	2.9138	-0.4877
280.0	0.8760	-2.9422	-4.2824	5.2551	2.0348	2.8249	-0.4539
290.0	1.7257	-2.7939	-4.0546	5.2025	2.0403	2.6935	-0.4299
300.0	2.4606	-2.5350	-3.6573	5.0704	1.9682	2.4556	-0.3918
310.0	2.9699	-2.1523	-3.0436	4.7526	1.8033	2.0515	-0.3622
320.0	3.1981	[illegible]	[illegible]	[illegible]	1.5500	1.5642	-0.2989
330.0	3.1392	[illegible]	[illegible]	[illegible]	1.2628	1.0893	-0.2185
340.0	2.7709	-0.7556	-0.8776	2.9929	0.9324	0.6491	-0.1273
350.0	2.3521	-0.3945	-0.3649	2.4055	0.6743	0.3280	-0.0586
360.0	2.2940	[illegible]	0.0003	2.2940	0.3777	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_{ℓ}
0.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000
10.0	2.4256	0.4825	0.3315	2.4867	0.0777	-0.1226	0.0438
20.0	3.0564	1.0006	0.8587	3.3170	-0.2030	-0.4765	0.1097
30.0	3.5554	1.6691	1.5767	4.2193	-0.6058	-0.9626	0.1928
40.0	3.6563	2.3783	2.3476	4.9406	-1.1006	-1.4825	0.2659
50.0	3.4765	3.1128	3.1539	5.6181	-1.6252	-2.0207	0.3411
60.0	2.9048	3.7178	3.8270	6.0608	-2.1155	-2.4796	0.3915
70.0	2.0427	4.1111	4.2502	6.2413	-2.4793	-2.7446	0.3792
80.0	1.0668	4.4413	4.6330	6.4915	-2.8110	-3.0288	0.4334
90.0	0.0026	4.4991	4.7027	6.4943	-2.9496	-3.0837	0.4691
100.0	-1.0589	4.4083	4.5856	6.4337	-3.0039	-3.0240	0.4286
110.0	-2.0759	4.1718	4.3319	6.3481	-2.9562	-2.8548	0.4310
120.0	-2.8908	3.7073	3.8154	6.0402	-2.7550	-2.5471	0.3905
130.0	-3.4758	3.1151	3.1576	5.6209	-2.4505	-2.1278	0.3285
140.0	-3.6822	2.3941	2.3642	4.9739	-2.0257	-1.5967	0.2691
150.0	-3.5626	1.6736	1.5811	4.2288	-1.5790	-1.0931	0.1952
160.0	-3.0991	1.0132	0.8722	3.3654	-1.1153	-0.6481	0.1112
170.0	-2.4378	0.4830	0.3336	2.4990	-0.7103	-0.3084	0.0444
180.0	-2.3101	-0.0013	0.0002	2.3101	-0.3765	-0.0923	0.0000
190.0	-2.4323	-0.4831	-0.3309	2.4933	-0.0846	0.1288	-0.0459
200.0	-3.0870	-1.0081	-0.8672	3.3497	0.2002	0.4841	-0.1150
210.0	-3.5728	-1.6762	-1.5849	4.2399	0.5968	0.9628	-0.1977
220.0	-3.6949	-2.3999	-2.3714	4.9896	1.0960	1.4927	-0.2756
230.0	-3.4628	-3.1010	-3.1408	5.5958	1.6095	2.0169	-0.3520
240.0	-2.9075	-3.7156	-3.8337	6.0670	2.1047	2.4823	-0.4068
250.0	-2.0594	-4.1414	-4.2973	6.2991	2.4965	2.7928	-0.4147
260.0	-1.0750	-4.4444	-4.6372	6.4962	2.8020	3.0298	-0.4580
270.0	-0.0029	-4.5023	-4.7028	6.4965	2.9545	3.0854	-0.4786
280.0	1.0597	-4.4005	-4.5839	6.4275	3.0023	3.0174	-0.4537
290.0	2.0661	-4.1416	-4.3016	6.3047	2.9443	2.8588	-0.4375
300.0	2.8942	-3.6992	-3.8105	6.0342	2.7564	2.5291	-0.3974
310.0	3.4565	-3.0920	-3.1428	5.5825	2.4458	2.1043	-0.3359
320.0	3.6773	-2.3883	-2.3568	4.9642	2.0336	1.5935	-0.2743
330.0	3.5603	-1.6700	-1.5762	4.2237	1.5873	1.0951	-0.1914
340.0	3.0523	-1.0015	-0.8570	3.3223	1.1097	0.6556	-0.1125
350.0	2.4225	-0.4815	-0.3297	2.4853	0.7158	0.2995	-0.0458
360.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0922	0.0000
10.0	2.5385	0.5669	0.2913	2.6078	0.0281	-0.0965	0.0342
20.0	3.3367	[illegible]	[illegible]	[illegible]	-0.3842	-0.4314	0.0882
30.0	3.8533	[illegible]	[illegible]	[illegible]	-0.9019	-0.8677	0.1490
40.0	4.1120	3.1002	2.2188	5.5931	-1.5525	-1.3971	0.2259
50.0	3.8869	4.0609	2.9722	6.3449	-2.2467	-1.907.	0.2840
60.0	3.2900	[illegible]	[illegible]	[illegible]	-2.8956	-2.3679	0.3367
70.0	2.3676	[illegible]	[illegible]	[illegible]	-3.4132	-2.7051	0.3673
80.0	1.2227	5.9296	4.4450	7.4993	-3.7827	-2.9103	0.3868
90.0	0.0018	5.9980	4.4961	7.4846	-3.9434	-2.9561	0.4139
100.0	-1.2201	[illegible]	[illegible]	[illegible]	-3.9940	-2.9116	0.3751
110.0	-2.3650	[illegible]	[illegible]	[illegible]	-3.8770	-2.7304	0.3902
120.0	-3.2942	4.9241	3.6548	6.9482	-3.5661	-2.4135	0.3512
130.0	-3.9019	4.0753	2.9859	6.3698	-3.0891	-1.9926	0.2892
140.0	-4.1140	[illegible]	[illegible]	[illegible]	-2.5105	-1.5067	0.2276
150.0	-3.8578	2.1036	[illegible]	4.6089	-1.8482	-1.0084	0.1502
160.0	-3.3550	1.2531	0.7920	3.6550	-1.2772	-0.5945	0.0890
170.0	-2.5557	0.5681	0.2957	2.6252	-0.7714	-0.2832	0.0387
180.0	-2.3021	[illegible]	0.0000	2.3021	-0.3765	-0.0926	0.0000
190.0	-2.5326	[illegible]	-0.2896	2.6017	-0.0357	0.1018	-0.0362
200.0	-3.3289	-1.2425	-0.7820	3.6256	0.3425	0.4304	-0.0911
210.0	-3.8416	-2.0917	-1.4290	4.5873	0.8829	0.8673	-0.1557
220.0	-4.0854	-3.0786	[illegible]	-5.5553	1.5265	1.3081	-0.2338
230.0	-3.8545	-4.0227	[illegible]	6.7867	2.2111	1.8945	-0.2971
240.0	-3.2662	-4.8767	-3.6189	6.8838	2.8589	2.3548	-0.3541
250.0	-2.3308	-5.4733	-4.0851	7.2045	3.3563	2.6654	-0.3812
260.0	-1.2188	-5.8724	-4.4015	7.4278	3.7450	2.8932	-0.4157
270.0	-0.0025	-5.9427	-4.4564	7.4168	3.9079	2.9320	-0.4296
280.0	1.2111	-5.8474	-4.3812	7.3948	3.9721	2.8949	-0.4092
290.0	2.3380	-5.4788	-4.0943	7.2164	3.8461	2.7020	-0.4090
300.0	3.2599	-4.8643	-3.6012	6.8655	3.5469	2.3887	-0.3681
310.0	3.8548	-4.0212	-2.9407	6.2854	3.0742	1.9697	-0.2990
320.0	4.0700	-3.0678	-2.1920	5.5339	2.5054	1.4943	-0.2330
330.0	3.8234	-2.0827	-1.4210	4.5655	1.8500	0.9970	-0.1555
340.0	3.3020	-1.2340	-0.7746	3.5964	1.2764	0.5852	-0.0911
350.0	2.5231	-0.5639	-0.2878	2.5919	0.7715	0.2724	-0.0359
360.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOUR STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2942	-0.0014	0.0003	2.2942	0.5778	0.0922	0.0000
10.0	2.6451	0.6403	0.2365	2.7118	-0.0137	-0.0624	0.0258
20.0	3.5353	1.4530	0.6502	3.8636	-0.4802	-0.3445	0.0646
30.0	4.1241	2.4396	1.1982	4.9491	-1.1507	-0.7153	0.1106
40.0	4.3663	3.6750	1.8387	5.9814	-1.9454	-1.1497	0.1615
50.0	4.1441	4.8875	2.5069	6.8961	-2.7807	-1.5992	0.2172
60.0	3.5731	5.9588	3.0850	7.5914	-3.5664	-1.9980	0.2620
70.0	2.8722	6.7466	3.5170	8.0225	-4.1907	-2.2908	0.2891
80.0	1.3372	7.2257	3.7740	8.2532	-4.6265	-2.4738	0.3045
90.0	0.0016	7.3066	3.8209	8.2597	-4.7041	-2.5116	0.3350
100.0	-1.3389	7.2093	3.7647	8.2347	-4.8621	-2.4848	0.3012
110.0	-2.5686	6.7480	3.5184	8.0230	-4.6662	-2.3125	0.3143
120.0	-3.5663	5.9530	3.0829	7.5828	-4.2473	-2.0360	0.2761
130.0	-4.1958	4.8917	2.5043	6.9013	-3.6519	-1.6749	0.2237
140.0	-4.3607	3.6722	1.8367	5.9749	-2.8678	-1.2562	0.1621
150.0	-4.1275	2.4922	1.2003	4.9537	-2.1088	-0.8509	0.1117
160.0	-3.5495	1.4584	0.6537	3.8793	-1.4208	-0.5046	0.0651
170.0	-2.6576	0.6435	0.2365	2.7347	-0.8257	-0.2459	0.0241
180.0	-2.3035	-0.0015	0.0001	2.3035	-0.5764	-0.0926	0.0000
190.0	-2.6447	-0.6403	-0.2364	2.7213	-0.0059	0.0657	-0.0252
200.0	-3.5544	-1.4506	-0.6477	3.8620	0.4671	0.3411	-0.0662
210.0	-4.1152	-2.4780	-1.1924	4.9352	1.1283	0.7128	-0.1149
220.0	-4.3515	-3.6545	-1.8279	5.9552	1.9146	1.1460	-0.1699
230.0	-4.1718	-4.8529	-2.4822	6.8517	2.7453	1.5909	-0.2278
240.0	-3.5431	-5.8992	-3.0524	7.5175	3.5193	1.9834	-0.2767
250.0	-2.5659	-6.6704	-3.4732	7.9318	4.1394	2.2697	-0.3049
260.0	-1.3303	-7.1503	-3.7374	8.1694	4.5794	2.4548	-0.3304
270.0	-0.0021	-7.2537	-3.7941	8.1784	4.7670	2.4956	-0.3452
280.0	1.3242	-7.1268	-3.7253	8.1423	4.8151	2.4597	-0.3243
290.0	2.5430	-6.6618	-3.4733	7.9229	4.6286	2.2906	-0.3304
300.0	3.5559	-5.8859	-3.0444	7.4961	4.2280	2.0136	-0.2945
310.0	4.1620	-4.8405	-2.4754	6.8445	3.6215	1.6609	-0.2353
320.0	4.3433	-3.6484	-1.8236	5.9441	2.8775	1.2504	-0.1695
330.0	4.1026	-2.4724	-1.1685	4.9206	2.1145	0.8463	-0.1147
340.0	3.5134	-1.4429	-0.6463	3.8356	1.4257	0.5007	-0.0662
350.0	2.6200	-0.6562	-0.2358	2.6961	0.8236	0.2388	-0.0248
360.0	2.2942	-0.0014	0.0003	2.2942	0.5778	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

e) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0.0922	0.0000
10.0	2.7176	0.6981	0.1684	2.8002	-0.0461	-0.0197	0.0123
20.0	3.6138	1.5	0.0529	3.	-0.5914	-0.2123	0.0310
30.0	4.3438	2.8	0.0643	5.22	-1.3512	-0.4971	0.0654
40.0	4.5668	4.335	1.3187	6.2848	-2.2521	-0.8126	0.0996
50.0	4.3616	5.4845	1.7450	7.2191	-3.1919	-1.1323	0.1323
60.0	3.7309	6.7150	2.0133	7.9868	-4.0743	-1.4301	0.1703
70.0	2.6960	7.6	2.5272	8.4702	-4.7 07	-1.6462	0.1923
80.0	1.4093	8.1829	2.7207	8.7336	-5.2529	-1.7839	0.2155
90.0	0.0009	8.3042	2.7599	8.7472	-5.4524	-1.8121	0.2277
100.0	-1.4078	8.1	2.7133	8.7193	-5.4829	-1.7854	0.2117
110.0	-2.6886	7.6168	2.5202	8.4552	-5.2347	-1.6561	0.2131
120.0	-3.7097	6.8865	2.2021	7.9585	-4.7122	-1.4517	0.1857
130.0	-4.3353	5.4566	1.7733	7.1792	-3.9608	-1.1932	0.1380
140.0	-4.5618	3.1298	1.3160	6.2784	-3.1653	-0.9141	0.0995
150.0	-4.3163	2.7937	0.8580	5.1973	-2.5092	-0.6275	0.0651
160.0	-3.6279	1.5995	0.4550	3.9764	-1.4957	-0.3792	0.0313
170.0	-2.7271	0.6993	0.1678	2.8097	-0.8667	-0.1989	0.0123
180.0	-2.3035	-0.0015	0.0001	2.3035	-0.3764	-0.0926	0.0000
190.0	-2.7173	-0.6964	-0.1674	2.7996	0.0363	0.0194	-0.0130
200.0	-3.6301	-1.5954	-0.4519	3.9767	0.5755	0.2173	-0.0347
210.0	-4.3139	-2.7819	-0.8525	5.1888	1.3209	0.4912	-0.0679
220.0	-4.5613	-4.1150	-1.3114	6.2600	2.2164	0.8068	-0.1037
230.0	-4.3478	-5.4518	-1.7713	7.1826	3.1452	1.1253	-0.1418
240.0	-3.7085	-6.6588	-2.1916	7.9222	4.0212	1.4172	-0.1790
250.0	-2.6859	-7.5800	-2.5083	8.4163	4.7369	1.6574	-0.2056
260.0	-1.4095	-8.1496	-2.7 69	8.6961	5.2347	1.7775	-0.2300
270.0	-0.0018	-8.2993	-2.7551	8.7411	5.4552	1.8116	-0.2432
280.0	1.4036	-8.1267	-2.6993	8.6733	5.4708	1.7804	-0.2271
290.0	2.6805	-7.5630	-2.5017	8.3998	5.2235	1.6508	-0.2273
300.0	3.6957	-6.6370	-2.1825	7.8954	4. 137	1.4485	-0.1936
310.0	4.3386	-5.4485	-1.7660	7.1663	4.0060	1.1902	-0.1487
320.0	4.5540	-4.1089	-1.3084	6.2579	3.1731	0.9097	-0.1038
330.0	4.2915	-2.7688	-0.8467	5.1622	2.5153	0.6220	-0.0676
340.0	3.6182	-1.5906	-0.4503	3.9639	1.5051	0.3704	-0.0348
350.0	2.5994	-0.6931	-0.1655	2.7815	0.8670	0.1963	-0.0128
360.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2942	-0.0014	0.0003	2.2942	0.5778	0.0922	0.0000
10.0	2.7456	0.7334	0.0890	2.8498	-0.0674	0.0502	-0.0001
20.0	3.7243	1.7025	0.2391	4.0872	-0.6561	-0.0740	0.0035
30.0	4.4139	2.9777	0.4483	5.3276	-1.4795	-0.2237	0.0135
40.0	4.6873	4.4237	0.6905	6.4678	-2.4436	-0.4005	0.0321
50.0	4.4639	5.8611	0.9323	7.4148	-3.4553	-0.5757	0.0496
60.0	3.8020	7.1606	1.1537	8.1814	-4.3922	-0.7369	0.0721
70.0	2.7487	8.1439	1.3205	8.6919	-5.1296	-0.8552	0.0882
80.0	1.4358	8.7824	1.4287	9.0127	-5.6652	-0.9357	0.1066
90.0	0.0001	8.9236	1.4475	9.0392	-5.8570	-0.9495	0.1142
100.0	-1.4450	8.7755	1.4246	9.0053	-5.8804	-0.9398	0.1034
110.0	-2.7464	8.1480	1.3195	8.6948	-5.5697	-0.8720	0.0990
120.0	-3.7871	7.1415	1.1499	8.1571	-4.9946	-0.7716	0.0756
130.0	-4.4549	5.8592	0.9316	7.4108	-4.2319	-0.6454	0.0502
140.0	-4.6892	4.4267	0.6911	6.4713	-3.3578	-0.5045	0.0321
150.0	-4.4085	2.9760	0.4463	5.3220	-2.4147	-0.3611	0.0132
160.0	-3.7257	1.7042	0.2395	4.0892	-1.5664	-0.2368	0.0039
170.0	-2.7408	0.7365	0.0888	2.8672	-0.8930	-0.1468	-0.0002
180.0	-2.3061	-0.0016	0.0001	2.3061	-0.3764	-0.0924	0.0000
190.0	-2.7649	-0.7322	-0.0889	2.8508	0.0570	-0.0329	0.0000
200.0	-3.7229	-1.6979	-0.2373	4.0844	0.6418	0.0749	-0.0046
210.0	-4.8157	-2.9669	-0.4425	5.3216	1.4543	0.2237	-0.0159
220.0	-4.6899	-4.4087	-0.6837	6.4596	2.4142	0.3958	-0.0327
230.0	-4.4604	-5.8331	-0.9209	7.3899	3.4161	0.5692	-0.0513
240.0	-3.7875	-7.1073	-1.1393	8.1266	4.3395	0.7274	-0.0727
250.0	-2.7560	-8.1265	-1.3123	8.6770	5.1092	0.8520	-0.0921
260.0	-1.4505	-8.7524	-1.4178	8.9426	5.6333	0.9292	-0.1119
270.0	-0.0017	-8.9423	-1.4491	9.0579	5.8760	0.9566	-0.1247
280.0	1.4460	-8.7371	-1.4158	8.9666	5.8648	0.9350	-0.1102
290.0	2.7429	-8.0900	-1.3060	8.6377	5.5506	0.8673	-0.1002
300.0	3.7860	-7.0688	-1.1321	8.0819	4.9695	0.7603	-0.0805
310.0	4.4358	-5.8054	-0.9156	7.3544	4.2177	0.6552	-0.0540
320.0	4.6714	-4.3921	-0.6805	6.4346	3.3524	0.4978	-0.0328
330.0	4.3801	-2.9459	-0.4373	5.2817	2.4186	0.3518	-0.0164
340.0	3.7940	-1.6911	-0.2361	4.0680	1.5713	0.2358	-0.0048
350.0	2.7402	-0.7285	-0.0882	2.8517	0.8927	0.1486	0.0002
360.0	2.2942	-0.0014	0.0003	2.2942	0.5778	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000
10.0	2.7677	-0.7419	0.0001	2.8507	0.0737	0.0897	-0.0142
20.0	3.7612	1.7410	0.0000	4.1298	-0.6849	0.0826	-0.0268
30.0	4.4331	3.0329	0.0007	5.3556	-1.5213	0.0699	-0.0358
40.0	4.6784	-4.4673	-0.0001	6.4553	5.3847	0.0571	-0.0413
50.0	4.4217	-3.0118	-0.0001	5.3351	2.4539	0.0417	-0.0415
60.0	3.8130	7.2961	-0.0006	8.2250	-4.5084	0.0255	-0.0346
70.0	2.7561	8.2931	0.0000	8.7355	-5.2506	0.0125	-0.0239
80.0	1.4398	8.8958	-0.0015	9.0121	-5.2383	0.0030	-0.0102
90.0	-0.0015	9.0000	-0.0001	9.0000	-6.0159	0.0000	0.0000
100.0	-1.4425	8.8958	-0.0016	9.0121	-5.9493	-0.0038	-0.0130
110.0	-2.7515	8.2984	-0.0001	8.7589	-5.6604	-0.0140	-0.0266
120.0	-3.7851	7.3003	0.0003	8.2770	-5.0456	-0.0254	-0.0342
130.0	-4.4796	5.9999	-0.0000	7.2998	-4.0951	-0.0390	-0.0344
140.0	-4.6924	4.5026	0.0004	6.4887	-3.3824	-0.0565	-0.0407
150.0	-4.4304	3.0333	0.0000	5.3535	-2.4457	-0.0707	-0.0359
160.0	-3.7327	1.7311	0.0001	4.2997	-1.5741	-0.0820	-0.0265
170.0	-2.7814	0.7478	0.0001	2.8689	-0.8019	-0.0897	-0.0141
180.0	-2.3061	-0.0016	0.0001	2.3061	-0.3764	-0.0924	0.0000
190.0	-2.7639	-0.7419	0.0001	2.8507	0.0737	-0.0897	0.0142
200.0	-3.7555	-1.7341	0.0000	4.1298	0.6684	-0.0826	0.0268
210.0	-4.4535	-3.0332	0.0000	5.3556	1.5050	-0.0707	0.0360
220.0	-4.7020	-4.4887	0.0002	6.4872	2.4836	-0.0563	0.0407
230.0	-4.4869	-5.9546	0.0001	7.4456	3.3048	-0.0410	0.0407
240.0	-3.8100	-7.2489	0.0000	8.1827	4.4489	-0.0250	0.0340
250.0	-2.7677	-8.2756	0.0003	8.7231	5.2210	-0.0135	0.0249
260.0	-1.4571	-8.8908	0.0000	9.0082	5.7322	-0.0042	0.0109
270.0	-0.0014	-9.0058	0.0000	9.2054	6.0488	0.0000	0.0000
280.0	1.4539	-8.8855	0.0000	9.0029	5.9486	0.0045	0.0122
290.0	2.7521	-8.2323	0.0000	8.6770	5.6243	0.0126	0.0237
300.0	3.7827	-7.1981	0.0000	8.1261	5.0379	0.0249	0.0338
310.0	4.4658	-5.9998	-0.0001	7.0185	4.2868	0.0411	0.0409
320.0	4.6784	-4.4673	-0.0001	6.4553	3.3847	0.0566	0.0410
330.0	4.4217	-3.0118	-0.0001	5.3351	2.4539	0.0708	0.0360
340.0	3.7826	-1.7209	0.0000	4.0857	1.5899	0.0822	0.0265
350.0	2.7433	-0.7379	0.0003	2.8297	0.8886	0.0900	0.0142
360.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2940	-0.0014	0.0003	2.2940	0.5777	0.0922	0.0000
10.0	2.7772	0.7359	-0.0893	2.8635	-0.0674	0.1496	-0.0279
20.0	3.7261	1.7028	-0.2390	4.0890	-0.6552	0.2392	-0.0562
30.0	4.4157	2.9784	-0.4471	5.3294	-1.4785	0.3643	-0.0842
40.0	4.6825	4.4190	-0.6901	6.4612	-2.4435	0.5137	-0.1128
50.0	4.4699	5.8674	-0.9326	7.4235	-3.4582	0.6577	-0.1300
60.0	3.8114	7.1735	-1.1550	8.1974	-4.3964	0.7879	-0.1395
70.0	2.7464	8.1402	-1.3190	8.6881	-5.1290	0.8816	-0.1385
80.0	1.4428	8.7679	-1.4236	8.9974	-5.6559	0.9405	-0.1267
90.0	-0.0030	8.9259	-1.4479	9.0415	-5.8588	0.9494	-0.1144
100.0	-1.4484	8.7947	-1.4300	9.0254	-5.8906	0.9539	-0.1292
110.0	-2.7473	8.1555	-1.3221	8.7024	-5.5744	0.8471	-0.1500
120.0	-3.7830	7.1370	-1.1480	8.1509	-4.9922	0.7198	-0.1438
130.0	-4.4573	5.8585	-0.9313	7.4085	-4.2290	0.5651	-0.1287
140.0	-4.6917	4.4311	-0.6918	6.4761	-3.3568	0.3919	-0.1126
150.0	-4.4153	2.9803	-0.4480	5.3301	-2.4187	0.2210	-0.0842
160.0	-3.7311	1.7069	-0.2403	4.0952	-1.5708	0.0738	-0.0561
170.0	-2.7909	0.7388	-0.0898	2.8775	-0.8955	-0.0333	-0.0280
180.0	-2.3061	-0.0016	0.0001	2.3061	-0.5764	-0.0924	0.0000
190.0	-2.7544	-0.7329	0.0866	2.8504	-0.8569	-0.1464	0.0279
200.0	-3.7235	-1.6977	0.2375	4.0849	-0.6415	-0.2398	0.0572
210.0	-4.4196	-2.9672	0.4422	5.3226	1.4534	-0.3657	0.0873
220.0	-4.6963	-4.4153	0.6844	6.4676	2.4162	-0.5090	0.1133
230.0	-4.4611	-5.8331	0.9204	7.5903	3.4144	-0.6505	0.1317
240.0	-3.7869	-7.1052	1.1564	8.1243	4.3568	-0.7769	0.1403
250.0	-2.7548	-8.1216	1.3113	8.6718	5.1048	-0.8776	0.1419
260.0	-1.4499	-8.7455	1.4167	8.9757	5.6272	-0.9365	0.1331
270.0	-0.0010	-8.9456	1.4497	9.0613	5.8767	-0.9527	0.1245
280.0	1.4485	-8.7524	1.4184	8.9824	5.6719	-0.9272	0.1345
290.0	2.7452	-8.0956	1.3078	8.6440	5.5517	-0.8414	0.1493
300.0	3.7710	-7.0764	1.1344	8.0912	4.9721	-0.7119	0.1462
310.0	4.4422	-5.8089	0.9169	7.3595	4.2182	-0.5515	0.1343
320.0	4.6725	-4.3925	0.6600	6.4456	3.3509	-0.3842	0.1154
330.0	4.3802	-2.9461	0.4347	5.2821	2.4174	-0.2114	0.0866
340.0	3.7026	-1.6894	0.2358	4.0623	1.5679	-0.0693	0.0569
350.0	2.7536	-0.7297	0.0883	2.8391	0.8940	0.0317	0.0278
360.0	2.2940	-0.0014	0.0003	2.2940	0.5777	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2940	-0.0014	0.0003	2.2940	0.5777	0.0922	0.0000
10.0	2.7126	-0.6973	0.1683	2.7998	-0.0471	0.2003	-0.0390
20.0	3.6139	1.5929	-0.4527	3.9606	-0.5915	0.3773	-0.0813
30.0	4.3270	2.7985	-0.8604	5.2092	-1.3478	0.6365	-0.1324
40.0	4.5660	3.8188	-1.3188	6.0884	-2.2093	0.9253	-0.1769
50.0	4.3623	3.6021	-1.7848	7.2884	-3.1908	1.2152	-0.2105
60.0	3.7327	6.7161	-2.2130	7.9873	-4.0739	1.4806	-0.2354
70.0	2.6979	7.6280	-2.5257	8.4700	-4.7752	1.6713	-0.2410
80.0	1.4079	8.1707	-2.7159	8.7859	-5.2552	1.7875	-0.2341
90.0	-0.0038	8.2998	-2.7554	8.7867	-5.4446	1.8074	-0.2270
100.0	-1.4116	8.1889	-2.7225	8.7400	-5.4949	1.7821	-0.2370
110.0	-2.6895	7.6249	-2.5247	8.4642	-5.2431	1.6353	-0.2590
120.0	-3.7[illegible]	6.6798	-2.1998	7.9886	-4.7096	1.4038	-0.2461
130.0	-4.3[illegible]	5.4700	-1.7792	7.1974	-3.9893	1.1151	-0.2149
140.0	-4.5762	4.1430	-1.3224	6.2986	-3.1725	0.8041	-0.1769
150.0	-4.3277	2.8010	-0.8613	5.2112	-2.3157	0.4886	-0.1329
160.0	-3.8275	1.5991	-0.4555	3.9761	-1.4953	0.2154	-0.0813
170.0	-2.7203	0.6999	-0.1694	2.8111	-0.8658	0.0194	-0.0392
180.0	-2.3087	-0.0015	0.0001	2.3087	-0.5764	-0.0923	0.0000
190.0	-2.[illegible]231	-0.6982	0.1671	2.6055	0.0380	-0.1996	0.0397
200.0	-3.6428	-1.5992	0.4538	3.9902	0.5780	-0.3842	0.0851
210.0	-4.[illegible]277	-2.7908	0.8554	5.2050	1.3258	-0.6343	0.1355
22[illegible]	-4.5740	-4.1256	1.3152	6.2849	2.2221	-0.9223	0.1812
230.0	-4.3540	-5.4575	1.7728	7.1917	3.1510	-1.2095	0.2196
240.0	-3.7105	-6.6626	2.1918	7.9264	4.0260	-1.4689	0.2448
250.0	-2.6922	-7.5935	2.5123	8.4333	4.7411	-1.6658	0.2553
260.0	-1.4077	-8.1356	2.7026	8.6037	5.2227	-1.7820	0.2490
270.0	-0.0003	-8.2963	2.7542	8.7379	5.4486	-1.8093	0.2433
280.0	1.4072	-8.1474	2.7063	8.6954	5.4803	-1.7[illegible]	0.2517
290.0	2.6821	-7.5673	2.5038	8.4041	5.2224	-1.6248	0.2729
300.0	3.7007	-6.6438	2.1866	7.9046	4.7144	-1.4012	0.2552
310.0	4.3444	-5.4446	1.7673	7.1752	4.0014	-1.1102	0.2247
320.0	4.5567	-4.1108	1.3091	6.2613	3.1726	-0.7976	0.1800
330.0	4.3055	-2.7760	0.8508	5.1784	2.3172	-0.4825	0.1349
340.0	3.6111	-1.5879	0.4490	3.9561	1.5025	-0.2054	0.0846
350.0	2.6975	-0.6932	0.1651	2.7793	0.8665	-0.0156	0.0395
360.0	2.2940	-0.0014	0.0003	2.2940	0.5777	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m² L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000
10.0	2.6385	0.6409	-0.2369	2.7153	-0.0144	0.2437	-0.0485
20.0	3.5369	1.4555	-0.6496	3.6651	-0.4808	0.5094	-0.1109
30.0	4.1296	2.4914	-1.2006	4.9552	-1.1512	0.8597	-0.1738
40.0	4.3615	3.6696	-1.8363	5.9739	-1.9425	1.2617	-0.2325
50.0	4.1815	4.8723	-2.4933	6.8750	-2.7713	1.6774	-0.2890
60.0	3.5711	5.9530	-3.0821	7.5848	-3.5638	2.0480	-0.3230
70.0	2.5713	6.7408	-3.5147	8.0164	-4.1901	2.3196	-0.3385
80.0	1.3278	7.1540	-3.7347	8.1707	-4.5699	2.4469	-0.3225
90.0	-0.0037	7.2752	-3.8020	8.2014	-4.7810	2.4976	-0.3314
100.0	-1.3324	7.1926	-3.7603	8.2171	-4.8349	2.4628	-0.3293
110.0	-2.5601	6.7294	-3.5071	7.9997	-4.6544	2.2813	-0.3518
120.0	-3.5438	5.9199	-3.0615	7.5374	-4.2147	1.9669	-0.3324
130.0	-4.1807	4.8765	-2.4939	6.8778	-3.6177	1.5817	-0.2957
140.0	-4.3635	3.6753	-1.8377	5.9791	-2.8688	1.1440	-0.2325
150.0	-4.1295	2.4940	-1.2007	4.9563	-2.1092	0.7106	-0.1733
160.0	-3.5520	1.4529	-0.6506	3.8606	-1.4148	0.3373	-0.1110
170.0	-2.6552	0.6427	-0.2387	2.7322	-0.8244	0.0657	-0.0488
180.0	-2.3087	-0.0015	0.0001	2.3087	-0.3764	-0.0923	0.0000
190.0	-2.6414	-0.6401	0.2353	2.7179	0.0067	-0.2458	0.0498
200.0	-3.5418	-1.4520	0.6488	3.8692	0.4681	-0.5078	0.1127
210.0	-4.1305	-2.4870	1.1980	4.9535	1.1319	-0.8574	0.1776
220.0	-4.3678	-3.6672	1.8352	5.9772	1.9204	-1.2628	0.2412
230.0	-4.1774	-4.8592	2.4852	6.8609	2.7466	-1.6749	0.3000
240.0	-3.5474	-5.9061	3.0556	7.5263	3.5218	-2.0358	0.3378
250.0	-2.5544	-6.6899	3.4669	7.9561	4.1485	-2.3056	0.3562
260.0	-1.3290	-7.1414	3.7321	8.1590	4.5669	-2.4569	0.3472
270.0	0.0001	-7.2680	3.7996	8.1941	4.7761	-2.4973	0.3467
280.0	1.3302	-7.1570	3.7403	8.1765	4.8355	-2.4590	0.3550
290.0	2.5496	-6.8531	3.4660	7.9113	4.6265	-2.2635	0.3681
300.0	3.5320	-5.8891	3.0481	7.5056	4.2308	-1.9684	0.3510
310.0	4.1687	-4.8462	2.4792	6.8441	3.6232	-1.5815	0.3029
320.0	4.3926	-3.6468	1.8228	5.9424	2.8747	-1.1365	0.2399
330.0	4.1051	-2.4728	1.1896	4.9253	2.1142	-0.7060	0.1765
340.0	3.5168	-1.4441	0.6436	3.8425	1.4232	-0.3367	0.1121
350.0	2.6133	-0.6355	0.2327	2.6893	0.8263	-0.0579	0.0494
360.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000

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TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2940	[illegible]	[illegible]	[illegible]	0.3777	0.0922	0.0000
10.0	2.5365	[illegible]	[illegible]	[illegible]	0.0200	0.2771	-0.0561
20.0	3.3328	1.2450	-0.7844	3.6304	-0.3542	0.5961	-0.1295
30.0	3.8526	2.0987	-1.4353	4.6015	-0.9020	1.0111	-0.2046
40.0	4.1032	[illegible]	[illegible]	[illegible]	[illegible]	1.5121	-0.2893
50.0	3.8828	[illegible]	[illegible]	[illegible]	[illegible]	1.9913	-0.3484
60.0	3.2941	4.9187	-3.6505	6.9422	-2.8941	2.4235	-0.3956
70.0	2.3612	5.5373	-4.1372	7.2925	-3.4046	2.7242	-0.4080
80.0	1.2146	5.8718	-4.3977	7.4288	-3.7421	2.8808	-0.3903
90.0	-0.0042	5.9628	-4.4672	7.4379	-3.9132	2.9293	-0.4110
100.0	-1.2186	5.9069	-4.4271	7.4701	-3.9881	2.9004	-0.4071
110.0	-2.3545	5.5347	-4.1354	7.2872	-3.8610	2.6932	-0.4227
120.0	-3.2889	[illegible]	-3.6228	6.8927	-3.5296	2.3309	-0.4022
130.0	-3.8749	[illegible]	-2.9628	6.3268	-3.0660	1.8941	-0.3460
140.0	-4.1059	3.0987	-2.2154	5.5864	-2.5034	1.3884	-0.2888
150.0	-3.8523	2.1016	-1.4361	4.6027	-1.8447	0.8645	-0.2048
160.0	-3.3339	[illegible]	-0.7868	3.6323	-1.2704	0.4269	-0.1293
170.0	-2.5946	[illegible]	-0.2934	2.6241	-0.7707	0.1028	-0.0564
180.0	-2.3101	-0.0013	0.0002	2.3101	-0.5765	-0.0923	0.0000
190.0	-2.5401	-0.5671	0.2905	2.6093	-0.0344	-0.2831	0.0560
200.0	-3.3341	-1.2431	0.7829	3.4380	0.3429	-0.5975	0.1324
210.0	-3.8570	-2.0980	1.4358	4.6053	0.8861	-1.0139	0.2114
220.0	-4.1012	-3.0888	2.2118	5.5764	1.5310	-1.5062	0.2967
230.0	-3.8685	-4.0349	2.9528	6.3082	2.2167	-1.9832	0.3613
240.0	-3.2783	-4.8907	3.6298	6.9042	2.8656	-2.4165	0.4134
250.0	-2.3534	-5.5139	4.1227	7.2642	3.3835	-2.7246	0.4354
260.0	-1.2151	-5.8596	4.3914	7.4112	3.7319	-2.8889	0.4253
270.0	0.0005	-5.9556	4.4670	7.4336	3.9165	-2.9353	0.4318
280.0	1.2177	-5.8811	4.4084	7.4386	3.9924	-2.9018	0.4334
290.0	2.3235	-5.4538	4.0707	7.1793	3.8253	-2.6650	0.4327
300.0	3.2689	-4.8712	3.6191	6.8836	3.5538	-2.3444	0.4205
310.0	3.8683	[illegible]	2.9463	6.2965	3.0726	-1.8874	0.3607
320.0	4.0810	-3.0745	2.1478	5.5481	2.5060	-1.3828	0.2950
330.0	3.8367	-2.0882	1.4264	4.5809	1.8514	-0.8582	0.2100
340.0	3.3142	-1.2376	0.7779	3.6596	1.2771	-0.4218	0.1317
350.0	2.5157	-0.5620	0.2869	2.5843	0.7698	-0.0913	0.0576
360.0	2.2940	-0.0014	0.0003	2.2940	0.3777	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0.0922	0.0000
10.0	2.4249	0.0826	-0.3311	2.4859	0.0708	0.3050	-0.0623
20.0	3.0750	1.0066	-0.8637	3.3371	-0.2087	0.6491	-0.1447
30.0	3.5860	1.6822	-1.5903	4.2553	-0.6140	1.1147	-0.2398
40.0	3.7019	2.4065	-2.3760	4.9999	-1.1171	1.6138	-0.3195
50.0	3.4987	3.1334	-3.1742	5.6543	-1.6473	2.1276	-0.3939
60.0	2.9307	3.7495	-3.8608	6.1138	-2.1335	2.5536	-0.4412
70.0	2.0954	4.2020	-4.3613	6.3942	-2.5345	2.8602	-0.4479
80.0	1.0689	4.4431	-4.6216	6.4845	-2.8102	3.0270	-0.4329
90.0	-0.0043	4.5304	-4.7321	6.5370	-2.9786	3.1088	-0.4647
100.0	-1.0673	4.4561	-4.6452	6.5116	-3.0316	3.0476	-0.4535
110.0	-2.0559	4.1456	-4.2630	6.2895	-2.9348	2.8162	-0.4205
120.0	-2.9017	3.7242	-3.8263	6.0623	-2.7538	2.4841	-0.4265
130.0	-3.4748	3.1173	-3.1522	5.6182	-2.4460	2.0346	-0.3799
140.0	-3.6965	2.4046	-2.3723	4.9933	-2.0328	1.4921	-0.3200
150.0	-3.5765	1.6794	-1.5851	4.2407	-1.5826	0.9568	-0.2401
160.0	-3.0949	1.0127	-0.8720	3.3593	-1.1101	0.4814	-0.1450
170.0	-2.4497	0.4859	-0.3356	2.5113	-0.7103	0.1290	-0.0625
180.0	-2.3021	-0.0013	0.0000	2.3021	-0.5765	-0.0926	0.0000
190.0	-2.4174	-0.4815	0.3279	2.4785	-0.6856	-0.3080	0.0623
200.0	-3.0854	-1.0076	0.8656	3.3470	0.1996	-0.6506	0.1878
210.0	-3.5825	-1.6794	1.5887	4.2508	0.5986	-1.1091	0.2448
220.0	-3.7060	-2.4055	2.3779	5.0036	1.1003	-1.6144	0.3298
230.0	-3.4809	-3.1141	3.1561	5.6228	1.6210	-2.1172	0.4078
240.0	-2.9157	-3.7257	3.8365	6.0773	2.1127	-2.5501	0.4605
250.0	-2.0763	-4.1837	4.3241	6.3377	2.5085	-2.8451	0.4629
260.0	-1.0597	-4.4010	4.5800	6.4258	2.7761	-3.0015	0.4614
270.0	0.0012	-4.4934	4.6879	6.4794	2.9514	-3.0797	0.4829
280.0	1.0625	-4.4174	4.5994	6.4506	3.0195	-3.0296	0.4739
290.0	2.0266	-4.0903	4.2341	6.2122	2.9052	-2.7809	0.4470
300.0	2.8922	-3.6974	3.8064	5.8294	2.7595	-2.4831	0.4409
310.0	3.4379	-3.0768	3.1123	5.5511	2.4356	-2.0090	0.3889
320.0	3.6648	-2.4807	2.5467	4.9465	2.0295	-1.4759	0.3263
330.0	3.5567	-1.6687	1.5704	4.2195	1.5868	-0.9539	0.2434
340.0	3.0572	-1.0510	0.8562	3.3172	1.1100	-0.5718	0.1467
350.0	2.4061	-0.4791	0.3264	2.4664	0.7107	-0.1161	0.0639
360.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0.0922	0.0000

TABLE IV - SPACE OPERATIONS CENTER FOURTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	[illegible]	[illegible]	[illegible]	[illegible]	0.3778	0.0922	0.0000
10.0	[illegible]	[illegible]	[illegible]673	[illegible]	0.1591	0.3328	-0.0723
20.0	2.7674	0.7556	-0.8791	2.9901	-0.0602	0.6602	-0.1527
30.0	3.1557	1.2162	-1.5785	3.7204	-0.3279	1.1071	-0.2521
40.0	[illegible]	[illegible]	[illegible]	[illegible]	-0.6782	1.5811	-0.3540
50.0	[illegible]	[illegible]	[illegible]	[illegible]	-1.0340	2.0499	-0.4127
60.0	2.5064	2.5823	-3.7220	5.1628	-1.3836	2.4566	-0.4626
70.0	1.7373	2.8169	-4.0818	5.2394	-1.6494	2.6594	-0.4330
80.0	[illegible]	[illegible]	[illegible]3041	[illegible]	-1.8454	2.8054	-0.4270
90.0	[illegible]	[illegible]	[illegible]	[illegible]	-2.0001	2.9255	-0.4783
100.0	-0.8835	2.9887	-4.3592	5.3428	-2.0577	2.8633	-0.4645
110.0	-1.7275	2.8117	-4.0691	5.2233	-2.0444	2.6879	-0.4354
120.0	-2.4312	[illegible]	[illegible]6135	[illegible]	-1.9410	2.3907	-0.3968
130.0	-2.9779	[illegible]	[illegible]9559	[illegible]	-1.8031	1.9820	-0.3988
140.0	-3.2185	1.7039	-2.3321	4.3113	-1.5518	1.4644	-0.3350
150.0	-3.1647	1.2205	-1.5858	3.7325	-1.2643	0.9590	-0.2518
160.0	-2.8174	[illegible]	-0.8967	[illegible]	-0.9553	0.4985	-0.1529
170.0	-2.3637	[illegible]	-0.3688	[illegible]	-0.6718	0.1439	-0.0728
180.0	-2.3035	-0.0015	0.0001	2.3035	-0.3764	-0.0926	0.0000
190.0	-2.3365	-0.3937	0.3615	2.3895	-0.1601	-0.3227	0.0728
200.0	-2.7937	-0.7598	0.8862	3.0178	0.0552	-0.6629	0.1549
210.0	-3.1644	-1.2183	1.5434	3.7307	0.3216	-1.1059	0.2557
220.0	-3.1917	-1.6473	2.3106	4.2735	0.6559	-1.5649	0.3419
230.0	-2.9734	-2.1553	3.0480	4.7587	1.0095	-2.0249	0.4224
240.0	-2.4643	-2.5444	3.6621	5.0804	1.3496	-2.4140	0.4752
250.0	-1.7295	-2.7879	4.0401	5.1861	1.6207	-2.6439	0.4656
260.0	-0.8686	[illegible]	[illegible]	[illegible]	1.8175	-2.7739	0.4457
270.0	0.0024	[illegible]	[illegible]	[illegible]	1.9796	-2.8892	0.4863
280.0	0.8763	-2.9492	4.2498	5.2714	2.0398	-2.8341	0.4688
290.0	1.6861	-2.7481	3.9776	5.1048	2.0021	-2.6239	0.4361
300.0	2.4045	[illegible]	[illegible]	[illegible]	1.9266	-2.3521	0.4065
310.0	2.9270	[illegible]	[illegible]	[illegible]	1.7816	-1.9375	0.4909
320.0	3.1625	-1.6752	2.2862	4.2336	1.5395	-1.4359	0.3386
330.0	3.1243	-1.2056	1.5610	3.6830	1.2618	-0.9462	0.2540
340.0	2.7490	-0.7509	0.8704	2.9694	0.9290	-0.4797	0.1539
350.0	2.3314	-0.3920	0.3606	2.3842	0.6715	-0.1435	0.0726
360.0	2.2942	-0.0014	0.0003	2.2942	0.3778	0.0922	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 690 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.5350	0.4097	0.3870	2.5902	0.1998	-0.1918	0.0648
20.0	2.8991	0.7771	0.9079	3.1260	-0.0119	-0.5202	0.1461
30.0	3.2071	1.2288	1.5903	3.7782	-0.2788	-0.9686	0.2426
40.0	3.2316	1.7022	2.3235	4.3160	-0.6256	-1.4514	0.3235
50.0	2.9888	2.1618	3.0520	4.7738	-0.9886	-1.9469	0.4052
60.0	2.4634	2.5368	3.6346	5.0561	-1.3397	-2.3431	0.4371
70.0	1.7272	2.7979	4.0398	5.1925	-1.6251	-2.6083	0.4356
80.0	0.8898	2.9920	4.3546	5.3415	-1.8708	-2.8596	0.4738
90.0	0.0005	3.0432	4.4474	5.3731	-2.0028	-2.9347	0.5210
100.0	-0.8796	2.9562	4.2839	5.2619	-2.0535	-2.8490	0.4653
110.0	-1.7399	2.8219	4.0860	5.2461	-2.0748	-2.7349	0.4611
120.0	-2.4888	2.5705	3.6957	5.1292	-2.0160	-2.4968	0.4390
130.0	-3.0425	2.1961	3.1066	4.8579	-1.8630	-2.0864	0.4070
140.0	-3.3301	1.7436	2.3965	4.4453	-1.6245	-1.5987	0.3387
150.0	-3.3458	1.2715	1.6630	3.9355	-1.3497	-1.1182	0.2531
160.0	-2.9879	0.7987	0.9409	3.2250	-1.0004	-0.6544	0.1504
170.0	-2.5709	0.4146	0.3958	2.6273	-0.7311	-0.2989	0.0713
180.0	-2.5153	0.0013	-0.0041	2.5153	-0.4085	-0.0467	0.0008
190.0	-2.5773	-0.4141	-0.3992	2.6381	-0.2001	0.2088	-0.0714
200.0	-2.9587	-0.7893	-0.9361	3.1925	0.0102	0.5553	-0.1528
210.0	-3.2533	-1.2438	-1.6286	3.6336	0.2802	0.9978	-0.2504
220.0	-3.2677	-1.7200	-2.3677	4.3740	0.6289	1.4913	-0.3371
230.0	-3.0273	-2.1875	-3.1052	4.8437	0.9951	1.9895	-0.4238
240.0	-2.4961	-2.5725	-3.7079	5.1429	1.3476	2.3909	-0.4695
250.0	-1.7703	-2.8560	-4.1645	5.3373	1.6489	2.6995	-0.4652
260.0	-0.9087	-3.0295	-4.4445	5.4399	1.8749	2.8976	-0.5075
270.0	-0.0009	-3.0819	-4.5236	5.4584	2.0179	2.9613	-0.5436
280.0	0.9035	-3.0109	-4.3977	5.3900	2.0779	2.8780	-0.5137
290.0	1.7872	-2.8770	-4.1917	5.3742	2.1022	2.7300	-0.4983
300.0	2.5557	-2.6169	-3.7921	5.2550	2.0399	2.5054	-0.4568
310.0	3.0942	-2.2261	-3.1645	4.9407	1.8815	2.0871	-0.4204
320.0	3.3496	-1.7547	-2.4175	4.4756	1.6313	1.5873	-0.3485
330.0	3.3175	-1.2623	-1.6537	3.9047	1.3432	1.0995	-0.2567
340.0	2.9579	-0.7913	-0.9350	3.1917	1.0093	0.6455	-0.1529
350.0	2.5364	-0.4104	-0.3942	2.5927	0.7294	0.3056	-0.0705
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

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TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.6043	0.5018	0.3495	2.6672	0.1200	-0.1658	0.0554
20.0	3.2132	1.0369	0.8926	3.4811	-0.1639	-0.5170	0.1311
30.0	3.6439	1.6000	1.6046	4.5169	-0.5731	-0.9871	0.2183
40.0	3.6962	2.3958	2.3570	4.9818	-1.0685	-1.4847	0.2897
50.0	3.4826	3.1174	3.1501	5.4220	-1.5989	-2.0140	0.3649
60.0	2.9275	3.7425	3.8465	6.0987	-2.1054	-2.4905	0.4212
70.0	2.0503	4.1169	4.2413	6.2488	-2.4234	-2.7413	0.3939
80.0	1.0618	4.4318	4.6034	6.4625	-2.6062	-3.0186	0.4460
90.0	-0.0016	4.5141	4.7047	6.5056	-2.9643	-3.0945	0.4998
100.0	-1.0729	4.4438	4.6143	6.4882	-3.0336	-3.0453	0.4605
110.0	-2.1461	4.2169	4.3828	6.4839	-3.0043	-2.8453	0.4356
120.0	-2.9524	3.7710	3.8842	6.1521	-2.8202	-2.5711	0.4373
130.0	-3.5632	3.1766	3.2223	5.7453	-2.5247	-2.1550	0.4745
140.0	-3.8176	2.4637	2.4375	5.1426	-2.1090	-1.6156	0.3112
150.0	-3.7361	1.7364	1.6466	4.4843	-1.6615	-1.0975	0.2297
160.0	-3.2941	1.0600	0.9168	3.5692	-1.1916	-0.6397	0.1353
170.0	-2.6527	0.5090	0.3590	2.7170	-0.7727	-0.2820	0.0573
180.0	-2.5168	0.0015	-0.0041	2.5168	-0.4006	-0.0467	0.0008
190.0	-2.6575	-0.5078	-0.3610	2.7218	-0.1265	0.1902	-0.0592
200.0	-3.2332	-1.0402	-0.9064	3.5044	0.1601	0.5310	-0.1350
210.0	-3.6362	-1.7152	-1.6337	4.3693	0.5669	1.0045	-0.2276
220.0	-3.7636	-2.4332	-2.4149	5.0774	1.0701	1.5244	-0.3079
230.0	-3.5140	-3.1368	-3.1877	5.6734	1.5934	2.0475	-0.3880
240.0	-2.9566	-3.7689	-3.8966	6.1613	2.1049	2.5238	-0.4499
250.0	-2.0932	-4.1907	-4.3591	6.3851	2.5085	2.8529	-0.4541
260.0	-1.0841	-4.4767	-4.6828	6.5546	2.8129	3.0562	-0.4415
270.0	0.0009	-4.5656	-4.7819	6.6477	2.9874	3.1264	-0.5284
280.0	1.0708	-4.4978	-4.6964	6.5795	3.0557	3.0646	-0.5108
290.0	2.1323	-4.2547	-4.4306	6.4884	3.0172	2.8467	-0.5440
300.0	2.9937	-3.8096	-3.9361	6.2287	2.8391	2.5697	-0.4615
310.0	3.5847	-3.1406	-3.2447	5.7742	2.5357	2.1544	-0.3952
320.0	3.8452	-2.4782	-2.4599	5.1806	2.1248	1.6114	-0.3239
330.0	3.7604	-1.7436	-1.6621	4.4535	1.6747	1.0980	-0.2361
340.0	3.2608	-1.0489	-0.9123	3.5337	1.1893	0.6241	-0.1382
350.0	2.6179	-0.5041	-0.4568	2.6816	0.7780	0.2785	-0.0580
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000
10.0	2.7229	0.5911	0.3072	2.7944	0.0642	-0.1390	0.0452
20.0	3.4768	1.2846	0.8109	3.7819	-0.3288	-0.4694	0.1062
30.0	3.9582	2.1438	1.4640	4.7195	-0.8778	-0.8973	0.1722
40.0	4.1623	3.1298	2.2538	5.6525	-1.5284	-1.4080	0.2482
50.0	3.9029	4.0746	3.0712	6.3627	-2.2256	-1.9022	0.3604
60.0	3.3025	4.9394	3.6532	6.9616	-2.8895	-2.3698	0.3549
70.0	2.3796	5.5720	4.1513	7.3322	-3.4151	-2.7185	0.3845
80.0	1.2185	5.9250	4.4218	7.4803	-3.7824	-2.9027	0.3906
90.0	-0.0036	6.0211	4.4987	7.5040	-3.9573	-2.9597	0.4272
100.0	-1.2396	5.9639	4.4556	7.5347	-4.0331	-2.9323	0.4049
110.0	-2.4081	5.6407	4.2162	7.4307	-3.9363	-2.7583	0.4318
120.0	-3.3645	5.0112	3.7205	7.0778	-3.6409	-2.4413	0.3953
130.0	-4.0125	4.1705	3.0577	6.5320	-3.1753	-2.0141	0.3384
140.0	-4.2678	3.1982	2.2927	5.7913	-2.6024	-1.5175	0.2690
150.0	-4.0445	2.1841	1.4986	4.8208	-1.9342	-1.0047	0.1830
160.0	-3.5662	1.3113	0.8352	3.8783	-1.3468	-0.5752	0.1114
170.0	-2.7695	0.5984	0.3146	2.8419	-0.8340	-0.2558	0.0469
180.0	-2.5088	0.0015	-0.0042	2.5088	-0.4086	-0.0470	0.0008
190.0	-2.7633	-0.5951	-0.3165	2.8359	-0.0734	0.1625	-0.0492
200.0	-3.4785	-1.2813	-0.8165	3.7839	0.3174	0.4779	-0.1107
210.0	-3.9602	-2.1405	-1.4714	4.7223	0.8617	0.9117	-0.1628
220.0	-4.1640	-3.1256	-2.2439	5.6559	1.5100	1.4231	-0.2645
230.0	-3.8985	-4.0586	-2.9159	6.3528	2.1983	1.9168	-0.3252
240.0	-3.3052	-4.9208	-3.6604	6.9546	2.8595	2.3819	-0.3856
250.0	-2.3654	-5.5344	-4.1391	7.2930	3.3763	2.7018	-0.4192
260.0	-1.2274	-5.9072	-4.4375	7.4784	3.7566	2.9146	-0.4424
270.0	0.0020	-6.0130	-4.5208	7.5120	3.9415	2.9626	-0.4687
280.0	1.2433	-5.9666	-4.4803	7.5531	4.0314	2.9327	-0.4625
290.0	2.4060	-5.6157	-4.2051	7.4052	3.9258	2.7381	-0.4721
300.0	3.3616	-4.9982	-3.7158	7.0651	3.6377	2.4192	-0.4267
310.0	3.9970	-4.1490	-3.0455	6.5034	3.1718	1.9917	-0.3544
320.0	4.2444	-3.1786	-2.2835	5.7599	2.6015	1.5048	-0.2797
330.0	4.0367	-2.1748	-1.4986	4.8105	1.9346	0.9905	-0.1926
340.0	3.5335	-1.2970	-0.8304	3.8427	1.3483	0.5629	-0.1160
350.0	2.7550	-0.5942	-0.3169	2.8275	0.8342	0.2461	-0.0482
360.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km.

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.50	-0.0014	-0.0051	2.5057	0.4092	0.0496	0.0000
10.0	2.81	0.6673	0.2485	2.8956	0.0102	-0.1047	0.0320
20.0	3.6996	1.5039	0.0734	4.[illegible]	-0.4618	-0.3865	0.0826
30.0	4.8333	2.6831	1.2810	6.0761	-1.1360	-0.7470	0.1515
40.0	4.4384	3.7250	1.8573	6.0704	-1.9351	-1.1689	0.1829
50.0	4.2211	4.9176	2.5034	6.9344	-2.7700	-1.5490	0.2303
60.0	3.5691	6.0649	3.0729	7.[illegible]	-3.5606	-1.9884	0.2664
70.0	2.5840	6.9768	3.5174	8.[illegible]	-4.1858	-2.2918	0.2908
80.0	1.3317	7.2194	3.7531	8.2364	-4.6298	-2.4637	0.3039
90.0	-0.0046	7.1390	3.8189	8.2650	-4.8182	-2.5102	0.3384
100.0	-1.3637	7.3157	3.8482	8.[illegible]	-4.9137	-2.5038	0.3341
110.0	-2.6293	6.8657	3.6858	8.[illegible]	-4.7868	-2.3317	0.3519
120.0	-3.6602	6.0879	3.1544	7.7619	-4.3359	-2.0553	0.3217
130.0	-4.3248	5.0187	2.5712	7.0938	-3.7290	-1.6873	0.2668
140.0	-4.5826	3.[illegible]	1.[illegible]967	6.1818	-2.9593	-1.2554	0.2066
150.0	-4.3156	2.[illegible]	1.2879	5.1688	-2.1889	-0.8371	0.1419
160.0	-3.7671	1.5264	0.6883	4.1047	-1.4961	-0.4784	0.0872
170.0	-2.8549	0.6761	0.2525	2.9351	-0.8753	-0.2141	0.0345
180.0	-2.8102	0.[illegible]413	-0.[illegible]841	2.[illegible]148	-0.4085	-0.0470	0.0008
190.0	-2.8707	-0.[illegible]133	-0.[illegible]358	2.[illegible]506	-0.0213	0.1243	-0.[illegible]348
200.0	-3.6938	-1.4975	-0.6766	4.0303	0.4446	0.3866	-0.0850
210.0	-4.2346	-2.5344	-1.2267	5.0713	1.1158	0.7547	-0.1394
220.0	-4.4604	-3.7286	-1.8720	6.[illegible]941	1.9146	1.1921	-0.2[illegible]
230.0	-4.2293	-4.[illegible]	-2.[illegible]	6.[illegible]	2.7423	1.6178	-0.[illegible]
240.0	-3.5708	-5.9341	-3.0765	7.5681	3.5189	1.9994	-0.2971
250.0	-2.5748	-6.7279	-3.5118	8.0057	4.1568	2.2944	-0.3331
260.0	-1.3383	-7.1774	-3.7599	8.2045	4.5900	2.4684	-0.3475
270.0	0.0031	-7.[illegible]282	-3.8416	8.2672	4.7983	2.5141	-0.3764
280.0	1.3597	-7.2728	-3.[illegible]189	8.3187	4.8801	2.4882	-0.3774
290.0	2.6162	-6.8266	-3.5683	8.[illegible]26	4.7133	2.3161	-0.3484
300.0	3.6439	-6.0449	-3.1363	7.7136	4.5219	2.0329	-0.3506
310.0	4.3106	-4.9825	-2.5622	7.0641	3.[illegible]267	1.6761	-0.2852
320.0	4.5269	-3.7789	-1.9001	6.1820	2.9763	1.2499	-0.2134
330.0	4.3212	-2.[illegible]778	-1.[illegible]2825	5.1716	2.[illegible]2018	0.8252	-0.1504
340.0	3.7813	-1.5130	-0.6865	4.0812	1.5001	0.4744	-0.0903
350.0	2.8409	-0.6686	-0.2558	2.9203	0.[illegible]778	0.2047	-0.0356
360.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000
10.0	2.4054	0.7281	0.1763	2.4904	-0.0236	-0.0040	0.0211
20.0	3.7823	1.6495	0.4684	4.1391	-0.5802	-0.2525	0.0472
30.0	4.4644	2.8732	0.8795	5.3684	-1.0523	-0.5289	0.0849
40.0	4.6489	4.1969	1.3311	6.3888	-2.2547	-0.8544	0.1195
50.0	4.4280	5.5540	1.7942	7.3192	-3.2010	-1.1487	0.1566
60.0	3.7552	6.7621	2.2129	8.0360	-4.0873	-1.4333	0.1816
70.0	2.7168	7.6906	2.5349	8.5347	-4.8005	-1.6552	0.2101
80.0	1.4140	8.2259	2.7156	8.7725	-5.2830	-1.7840	0.2238
90.0	-0.0039	8.3630	2.7618	8.8031	-5.4736	-1.8100	0.2384
100.0	-1.4344	8.2992	2.7498	8.8553	-5.5358	-1.7938	0.2444
110.0	-2.7507	7.7704	2.5704	8.6282	-5.3095	-1.6653	0.2546
120.0	-3.8092	6.8436	2.2540	8.1415	-4.7980	-1.4554	0.2277
130.0	-4.4784	5.6127	1.8260	7.3972	-4.0825	-1.1914	0.1815
140.0	-4.7269	4.2571	1.3565	6.4910	-3.2509	-0.9001	0.1342
150.0	-4.5031	2.8936	0.8891	5.4113	-2.3819	-0.6029	0.0916
160.0	-3.8416	1.6718	0.4772	4.2031	-1.5663	-0.3466	0.0514
170.0	-2.9263	0.7348	0.1768	3.0122	-0.9175	-0.1658	0.0223
180.0	-2.5102	0.0013	-0.0041	2.5102	-0.4085	-0.0470	0.0008
190.0	-2.9892	-0.7326	-0.1835	3.0348	0.4129	0.0763	-0.0240
200.0	-3.8026	-1.6513	-0.4744	4.1595	0.5569	0.2614	-0.0524
210.0	-4.4408	-2.8466	-0.8777	5.3334	1.5176	0.5507	-0.0905
220.0	-4.6807	-4.2049	-1.3449	6.4210	2.2301	0.8521	-0.1356
230.0	-4.4228	-5.5306	-1.8016	7.2960	3.1572	1.1568	-0.1719
240.0	-3.7569	-6.7284	-2.2191	8.0116	4.0374	1.4419	-0.2071
250.0	-2.7215	-7.6593	-2.5392	8.5101	4.7629	1.6608	-0.2374
260.0	-1.4275	-8.2142	-2.7351	8.7752	5.2620	1.7961	-0.2545
270.0	0.0026	-8.3971	-2.7954	8.8467	5.4905	1.8269	-0.2742
280.0	1.4391	-8.2896	-2.7613	8.8511	5.5391	1.7974	-0.2790
290.0	2.7535	-7.7400	-2.5675	8.6814	5.3058	1.6620	-0.2603
300.0	3.8095	-6.8161	-2.2492	8.1179	4.8119	1.4544	-0.2457
310.0	4.4874	-5.6024	-1.8245	7.3464	4.1015	1.1879	-0.1960
320.0	4.7366	-4.2492	-1.3624	6.4945	3.2623	0.8933	-0.1448
330.0	4.5014	-2.8784	-0.8904	5.4029	2.3458	0.5462	-0.1000
340.0	3.8597	-1.6705	-0.4830	4.2203	1.5861	0.3368	-0.0581
350.0	2.9174	-0.7286	-0.1815	3.0028	0.9265	0.1544	-0.0231
360.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000

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TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

P) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000
10.0	2.9646	0.7675	0.0933	3.0635	0.0468	-0.0140	0.0048
20.0	3.9018	2.7858	0.3388	4.1111	-0.3135	-0.1137	0.0189
30.0	4.5964	3.8912	0.4959	5.0700	-1.0037	-0.2570	0.0355
40.0	4.8017	4.5170	0.6991	6.6155	-2.4599	-0.4282	0.0552
50.0	4.5454	5.0584	0.9395	7.5416	-3.9018	-0.5913	0.0747
60.0	3.8712	7.0798	1.0829	8.3191	-4.8154	-0.7571	0.1029
70.0	2.7952	8.3712	1.3322	8.8978	-5.1801	-0.8734	0.1223
80.0	1.4633	8.8972	1.4343	9.1281	-5.7151	-0.9434	0.1371
90.0	-0.0040	9.0637	1.4574	9.1691	-5.9083	-0.9534	0.1481
100.0	-1.4745	8.9342	1.4450	9.1678	-5.9434	-0.9402	0.1447
110.0	-2.8113	8.3205	1.3453	8.8808	-5.6437	-0.8671	0.1430
120.0	-3.8887	7.3120	1.1756	8.3572	-5.0775	-0.7597	0.1185
130.0	-4.5926	6.0139	0.9542	7.6150	-4.3143	-0.6260	0.0882
140.0	-4.8555	4.5614	0.7106	6.6868	-3.4413	-0.4777	0.0649
150.0	-4.6020	3.0848	0.4612	5.5442	-2.4912	-0.3266	0.0396
160.0	-3.9397	1.7802	0.2492	4.3165	-1.6360	-0.1962	0.0226
170.0	-2.9847	0.7746	0.0927	3.0746	-0.9445	-0.1082	0.0092
180.0	-2.5128	0.0018	0.0041	2.5128	-0.4085	-0.0468	0.0008
190.0	-2.9990	-0.7706	-0.0988	3.0481	-0.0348	-0.0200	-0.0101
200.0	-3.8679	-1.7541	-0.2492	4.2591	0.6309	0.1143	-0.0196
210.0	-4.5594	-3.0463	-0.4575	5.4883	1.4566	0.2614	-0.0276
220.0	-4.8356	-4.5245	-0.7050	6.6470	2.4399	0.4400	-0.0656
230.0	-4.5542	-5.9815	-0.9404	7.5347	3.4444	0.6016	-0.0145
240.0	-3.8645	-7.2315	-1.1617	8.2743	4.3799	0.7580	-0.1121
250.0	-2.8140	-8.2669	-1.3384	8.8310	5.1615	0.8791	-0.1369
260.0	-1.4781	-8.8854	-1.4428	9.1207	5.6851	0.9477	-0.1554
270.0	0.0002	-9.0968	-1.4769	9.2153	5.9360	0.9647	-0.1733
280.0	1.4826	-8.9207	-1.4515	9.1572	5.9404	0.9409	-0.1631
290.0	2.8169	-8.3745	-1.3425	8.8396	5.6303	0.8646	-0.1618
300.0	3.8774	-7.2497	-1.1673	8.2972	5.0565	0.7491	-0.1296
310.0	4.5831	-5.2708	-0.9482	7.5763	4.3061	0.6143	-0.0979
320.0	4.8514	-4.5368	-0.7099	6.6673	3.4414	0.4717	-0.0700
330.0	4.5897	-3.0605	-0.4608	5.5017	2.5017	0.3173	-0.0458
340.0	3.9329	-1.7689	-0.2531	4.3065	1.6416	0.1935	-0.0247
350.0	2.9659	-0.7651	-0.0981	3.0546	0.9465	0.1091	-0.0094
360.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000

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TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.9714	0.7790	-0.0049	3.0615	-0.0645	0.0483	-0.0066
20.0	3.9509	1.8094	-0.0054	4.3314	-0.6832	0.0433	-0.0115
30.0	4.6069	3.1315	-0.0050	5.5554	-1.5349	0.0338	-0.0137
40.0	4.8407	4.6194	-0.0062	6.6773	-2.5396	0.0259	-0.0133
50.0	4.6013	6.1157	-0.0066	7.6424	-3.5893	0.0155	-0.0068
60.0	3.9116	7.4651	-0.0069	8.4206	-4.5729	0.0023	0.0101
70.0	2.8214	8.4717	-0.0061	8.9256	-5.5222	-0.0028	0.0246
80.0	1.4712	9.0683	-0.0056	9.1858	-5.8124	-0.0028	0.0397
90.0	-0.0018	9.3520	-0.0063	9.3520	-6.0943	0.0026	0.0521
100.0	-1.4765	9.0916	-0.0066	9.2097	-6.0277	0.0072	0.0390
110.0	-2.8199	8.4848	-0.0051	8.9375	-5.7354	0.0061	0.0230
120.0	-3.8896	7.4364	-0.0047	8.3849	-5.1242	0.0032	0.0119
130.0	-4.6204	6.1444	-0.0046	7.6767	-4.5792	-0.0032	0.0021
140.0	-4.8707	4.6491	-0.0046	6.7195	-3.4711	-0.0139	-0.0069
150.0	-4.6357	3.1499	-0.0051	5.5895	-2.5235	-0.0226	-0.0093
160.0	-3.9556	1.8114	-0.0051	4.3366	-1.6415	-0.0304	-0.0083
170.0	-2.9870	0.7857	-0.0045	3.0780	-0.9400	-0.0445	-0.0056
180.0	-2.5128	0.0012	-0.0041	2.5128	-0.4085	-0.0468	0.0008
190.0	-2.9973	-0.7808	-0.0042	3.0873	0.0559	-0.0369	0.0053
200.0	-3.9277	-1.7943	-0.0033	4.3045	0.6603	-0.0454	0.0134
210.0	-4.6114	-3.1218	-0.0035	5.5545	1.5133	-0.0354	0.0159
220.0	-4.8701	-4.6260	-0.0033	6.7042	2.5184	-0.0159	0.0079
230.0	-4.6085	-6.1003	-0.0039	7.6353	3.5493	-0.0049	0.0044
240.0	-3.9146	-7.4231	-0.0042	8.3858	4.5110	0.0029	-0.0113
250.0	-2.8394	-8.4538	-0.0039	8.9150	5.2880	0.0061	-0.0238
260.0	-1.4932	-9.0770	-0.0043	9.1983	5.8043	0.0063	-0.0402
270.0	-0.0012	-9.4160	-0.0048	9.4160	6.1368	0.0019	-0.0529
280.0	1.4913	-9.0798	-0.0050	9.2008	6.0288	-0.0026	-0.0398
290.0	2.8262	-8.4172	-0.0050	8.8762	5.7025	-0.0036	-0.0258
300.0	3.8913	-7.3802	-0.0050	8.3371	5.1221	0.0003	-0.0122
310.0	4.6062	-6.0912	-0.0051	7.6269	4.3711	0.0093	0.0004
320.0	4.8570	-4.6131	-0.0051	6.6858	3.4723	0.0180	0.0071
330.0	4.6294	-3.1275	-0.0052	5.5728	2.5348	0.0267	0.0093
340.0	3.9475	-1.8005	-0.0050	4.3252	1.6592	0.0348	0.0084
350.0	2.9617	-0.7751	-0.0047	3.0512	0.9380	0.0458	0.0060
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

h) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.9801	0.7700	-0.0986	3.0694	-0.0466	0.1120	-0.0223
20.0	3.9210	1.7720	-0.2540	4.2964	-0.6523	0.2044	-0.0435
30.0	4.5933	3.0777	-0.4668	5.5338	-1.4924	0.3334	-0.0647
40.0	4.8355	4.5427	-0.7141	6.6594	-2.4709	0.4900	-0.0885
50.0	4.5963	6.0147	-0.9605	7.6195	-3.5028	0.6396	-0.0980
60.0	3.9191	7.3545	-1.1886	8.4106	-4.4643	0.7758	-0.0977
70.0	2.8178	8.3262	-1.3529	8.8895	-5.2024	0.8781	-0.0925
80.0	1.4765	8.9596	-1.4579	9.1950	-5.7329	0.9453	-0.0755
90.0	-0.0030	9.1236	-1.4834	9.2424	-5.9382	0.9636	-0.0612
100.0	-1.4827	8.9886	-1.4650	9.2254	-5.9683	0.9571	-0.0772
110.0	-2.8190	8.3466	-1.3574	8.9096	-5.6558	0.8801	-0.1023
120.0	-3.8932	7.3219	-1.1824	8.3689	-5.0810	0.7615	-0.1014
130.0	-4.6009	6.0249	-0.9624	7.6305	-4.3165	0.6129	-0.0916
140.0	-4.8694	4.5751	-0.7191	6.7064	-3.4441	0.4448	-0.0824
150.0	-4.6198	3.0948	-0.4702	5.5655	-2.4977	0.2767	-0.0609
160.0	-3.9540	1.7859	-0.2569	4.3323	-1.6396	0.1297	-0.0409
170.0	-2.9962	0.7770	-0.0989	3.0865	-0.9472	0.0124	-0.0214
180.0	-2.5128	0.0012	-0.0041	2.5128	-0.4085	-0.0468	0.0008
190.0	-2.9961	-0.7709	0.0932	3.0852	0.0346	-0.1002	0.0214
200.0	-3.8932	-1.7560	0.2461	4.2645	0.6311	-0.2105	0.0477
210.0	-4.5719	-3.0537	0.4555	5.5026	1.4581	-0.3406	0.0729
220.0	-4.8622	-4.5468	0.7060	6.6816	2.4484	-0.4821	0.0878
230.0	-4.5820	-5.9742	0.9428	7.5775	3.4553	-0.6338	0.1040
240.0	-3.8905	-7.2728	1.1654	8.3230	4.3954	-0.7652	0.1040
250.0	-2.8224	-8.2894	1.3390	8.8548	5.1677	-0.8739	0.1025
260.0	-1.4838	-8.9192	1.4452	9.1549	5.6944	-0.9410	0.0914
270.0	-0.0009	-9.1213	1.4788	9.2395	5.9869	-0.9652	0.0818
280.0	1.4824	-8.9255	1.4467	9.1610	5.9439	-0.9471	0.0929
290.0	2.8132	-8.2642	1.3353	8.8277	5.6251	-0.8691	0.1098
300.0	3.8740	-7.2432	1.1609	8.2889	5.0534	-0.7471	0.1101
310.0	4.5763	-5.9623	0.9411	7.5646	4.3018	-0.5930	0.1031
320.0	4.8404	-4.5276	0.7015	6.6522	3.4361	-0.4315	0.0877
330.0	4.5793	-3.0549	0.4549	5.5094	2.4982	-0.2613	0.0663
340.0	3.9199	-1.7646	0.2461	4.2924	1.6393	-0.1197	0.0451
350.0	2.9651	-0.7654	0.0919	3.0536	0.9473	-0.0128	0.0220
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.9210	0.7306	-0.1836	3.0067	-0.0257	0.1641	-0.0346
20.0	3.8120	1.6599	-0.4796	4.1717	-0.3839	0.3483	-0.0721
30.0	4.5028	2.8922	-0.8960	5.4115	-1.3594	0.6120	-0.1164
40.0	4.7306	4.2575	-1.3666	6.4958	-2.2746	0.9109	-0.1577
50.0	4.5006	5.6364	-1.8424	7.4329	-3.2293	1.2151	-0.1926
60.0	3.8377	6.8855	-2.2740	8.1958	-4.1331	1.4850	-0.2060
70.0	2.7689	7.8095	-2.5911	8.6756	-4.8423	1.6833	-0.2053
80.0	1.4426	8.3644	-2.7831	8.9283	-5.3303	1.8061	-0.1869
90.0	-0.0033	8.4859	-2.8236	8.9397	-5.5214	1.8348	-0.1741
100.0	-1.4485	8.3850	-2.7931	8.9517	-5.5763	1.8207	-0.1862
110.0	-2.7690	7.8241	-2.5981	8.6908	-5.5369	1.6663	-0.2179
120.0	-3.8249	6.8703	-2.2691	8.1755	-4.8087	1.4622	-0.2102
130.0	-4.5100	5.6506	-1.8470	7.4503	-4.1005	1.1814	-0.1883
140.0	-4.7618	4.2864	-1.3764	6.5393	-3.2644	0.8706	-0.1523
150.0	-4.5326	2.9106	-0.9023	5.4471	-2.3924	0.5543	-0.1126
160.0	-3.8572	1.6771	-0.4860	4.2204	-1.5680	0.2788	-0.0692
170.0	-2.9333	0.7367	-0.1840	3.0199	-0.9169	0.0680	-0.0339
180.0	-2.5153	0.0013	-0.0041	2.5153	-0.4085	-0.0467	0.0008
190.0	-2.9514	-0.7339	0.1782	3.0368	0.0143	-0.1574	0.0350
200.0	-3.8202	-1.6576	0.4737	4.1779	0.5597	-0.3612	0.0801
210.0	-4.4786	-2.8689	0.8829	5.3775	1.5273	-0.6170	0.1263
220.0	-4.7343	-4.2480	1.3568	6.4907	2.2490	-0.9075	0.1633
230.0	-4.4781	-5.5950	1.8190	7.3825	3.1852	-1.2076	0.2041
240.0	-3.8103	-6.8147	2.2439	8.1155	4.0760	-1.4748	0.2264
250.0	-2.7538	-7.7394	2.5628	8.5995	4.7946	-1.6763	0.2321
260.0	-1.4381	-8.2674	2.7551	8.8469	5.2810	-1.7985	0.2196
270.0	-0.0003	-8.4477	2.8079	8.8986	5.5091	-1.8324	0.2049
280.0	1.4390	-8.3022	2.7598	8.8622	5.5470	-1.8045	0.2203
290.0	2.7490	-7.7269	2.5588	8.5855	5.2990	-1.6653	0.2454
300.0	3.8064	-6.8076	2.2425	8.1074	4.8062	-1.4479	0.2327
310.0	4.4838	-5.5963	1.8208	7.3875	4.0971	-1.1620	0.2056
320.0	4.7203	-4.2359	1.3514	6.4715	3.2555	-0.8517	0.1619
330.0	4.4978	-2.8760	0.8848	5.3978	2.3958	-0.5391	0.1205
340.0	3.8353	-1.6621	0.4733	4.1935	1.5812	-0.2616	0.0756
350.0	2.9068	-0.7270	0.1745	2.9916	0.9195	-0.0617	0.0353
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.8526	0.6727	-0.2583	2.9328	0.0077	0.2091	-0.0455
20.0	3.7448	1.5181	-0.6894	4.0864	-0.4666	0.4858	-0.1060
30.0	4.3212	2.5852	-1.2571	5.1759	-1.1552	0.8457	-0.1654
40.0	4.5242	3.7853	-1.9050	6.1850	-1.9571	1.2633	-0.2269
50.0	4.3198	5.0126	-2.5748	7.0881	-2.8005	1.6912	-0.2837
60.0	3.6847	6.1214	-3.1782	7.8095	-3.6169	2.0700	-0.3083
70.0	2.6435	6.9111	-3.6105	8.2247	-4.2535	2.3456	-0.3127
80.0	1.3656	7.3389	-3.8396	8.3867	-4.6437	2.4828	-0.2886
90.0	-0.0039	7.4691	-3.9128	8.4247	-4.8643	2.5460	-0.2951
100.0	-1.3707	7.3820	-3.8686	8.4386	-4.9198	2.5198	-0.2921
110.0	-2.6426	6.9200	-3.6167	8.2345	-4.7493	2.3496	-0.3210
120.0	-3.6733	6.1084	-3.1711	7.7909	-4.5245	2.0457	-0.3112
130.0	-4.3500	5.0469	-2.5930	7.1373	-3.7310	1.6636	-0.2796
140.0	-4.5649	3.8182	-1.9221	6.2401	-2.9715	1.2261	-0.2179
150.0	-4.3499	2.6025	-1.2649	5.2102	-2.1955	0.7880	-0.1606
160.0	-3.7710	1.5274	-0.6957	4.1150	-1.4928	0.4081	-0.1036
170.0	-2.8590	0.6770	-0.2585	2.9398	-0.8743	0.1169	-0.0448
180.0	-2.5153	0.0013	-0.0041	2.5153	-0.4085	-0.0467	0.0008
190.0	-2.8715	-0.6734	0.2524	2.9510	-0.0202	-0.2072	0.0471
200.0	-3.7157	-1.5045	0.6777	4.0531	0.4472	-0.4905	0.1116
210.0	-4.2845	-2.5611	1.2388	5.1291	1.1257	-0.8493	0.1756
220.0	-4.5368	-3.7858	1.8996	6.1933	1.9371	-1.2627	0.2352
230.0	-4.2984	-4.9816	2.5507	7.0446	2.7702	-1.6682	0.3007
240.0	-3.6407	-6.0376	3.1275	7.7027	3.5610	-2.0551	0.3342
250.0	-2.6096	-6.8139	3.5554	8.1081	4.1914	-2.3288	0.3512
260.0	-1.3564	-7.2727	3.8048	8.3115	4.6202	-2.4845	0.3339
270.0	0.0001	-7.4127	3.8794	8.3592	4.8395	-2.5340	0.3330
280.0	1.3586	-7.2916	3.8144	8.3328	4.8979	-2.4987	0.3368
290.0	2.6045	-6.7975	3.5452	8.0882	4.7040	-2.3124	0.3572
300.0	3.6400	-6.0354	3.1275	7.7007	4.3207	-2.0244	0.3434
310.0	4.3080	-4.9861	2.5545	7.0553	3.7226	-1.6422	0.2980
320.0	4.5132	-3.7664	1.8879	6.1606	2.9583	-1.1993	0.2338
330.0	4.2990	-2.5658	1.2399	5.1440	2.1963	-0.7678	0.1698
340.0	3.7270	-1.5086	0.6780	4.0650	1.4969	-0.3958	0.1078
350.0	2.8146	-0.6652	0.2467	2.8932	0.8751	-0.1034	0.0475
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000
10.0	2.7593	0.5960	-0.3190	2.8322	0.0616	0.2478	-0.0567
20.0	3.5383	1.3016	-0.8337	3.8492	-0.3363	0.5775	-0.1284
30.0	4.0471	2.1830	-1.5069	4.8252	-0.8940	1.0087	-0.2061
40.0	4.2714	3.1988	-2.3035	5.7988	-1.5575	1.5251	-0.2942
50.0	4.0218	4.1787	-3.0720	6.5499	-2.2662	2.0152	-0.3531
60.0	3.4048	5.0650	-3.7710	7.1617	-2.9345	2.4586	-0.3955
70.0	2.4403	5.7000	-4.2710	7.5174	-3.4613	2.7687	-0.4000
80.0	1.2537	6.0460	-4.5359	7.6499	-3.8088	2.9526	-0.3708
90.0	-0.0043	6.1333	-4.6083	7.6604	-3.9894	2.9928	-0.3911
100.0	-1.2579	6.0791	-4.5692	7.6967	-4.0709	2.9744	-0.3886
110.0	-2.4401	5.7091	-4.2800	7.5293	-3.9576	2.7794	-0.4116
120.0	-3.3967	5.0582	-3.7642	7.1494	-3.6358	2.4254	-0.3956
130.0	-4.0443	4.2018	-3.0879	6.5857	-3.1723	1.9896	-0.3415
140.0	-4.3130	3.2286	-2.3251	5.8543	-2.6083	1.4833	-0.2855
150.0	-4.0760	2.1992	-1.5180	4.8600	-1.9369	0.9501	-0.2013
160.0	-3.5601	1.3096	-0.8397	3.8731	-1.3431	0.5004	-0.1260
170.0	-2.7724	0.5994	-0.3202	2.8457	-0.8313	0.1584	-0.0560
180.0	-2.5168	0.0015	-0.0041	2.5168	-0.4086	-0.0467	0.0008
190.0	-2.7796	-0.5976	0.3143	2.8519	-0.0714	-0.2483	0.0585
200.0	-3.5038	-1.2879	0.8194	3.8100	0.3200	-0.5651	0.1352
210.0	-4.0107	-2.1640	1.4878	4.7803	0.8710	-1.0144	0.2174
220.0	-4.2336	-3.1718	2.2771	5.7456	1.5286	-1.5193	0.3072
230.0	-3.9815	-4.1352	3.0314	6.4784	2.2290	-2.0071	0.3746
240.0	-3.3547	-4.9891	3.7073	7.0508	2.8873	-2.4466	0.4297
250.0	-2.4037	-5.6159	4.2045	7.4042	3.4159	-2.7588	0.4492
260.0	-1.2398	-5.9688	4.4764	7.5517	3.7742	-2.9235	0.4281
270.0	0.0005	-6.0765	4.5651	7.5879	3.9691	-2.9821	0.4401
280.0	1.2437	-5.9941	4.4974	7.5847	4.0514	-2.9503	0.4372
290.0	2.3844	-5.5749	4.1649	7.3442	3.6988	-2.7209	0.4405
300.0	3.3647	-4.9982	3.7144	7.0658	3.6391	-2.4067	0.4299
310.0	3.9927	-4.1416	3.0357	6.4914	3.1634	-1.9527	0.3693
320.0	4.2477	-3.1784	2.2794	5.7606	2.5982	-1.4513	0.3006
330.0	4.0254	-2.1693	1.4886	4.7954	1.9354	-0.9226	0.2121
340.0	3.5095	-1.2909	0.8188	3.8160	1.3445	-0.4789	0.1321
350.0	2.7206	-0.5897	0.3056	2.7918	0.8305	-0.1578	0.0568
360.0	2.5056	-0.0014	-0.0051	2.5056	0.4092	0.0494	0.0000

TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000
10.0	2.6349	0.5067	-0.3608	2.6993	0.1163	0.2794	-0.0655
20.0	3.2843	1.0553	-0.9217	3.5596	-0.1763	0.6387	-0.1512
30.0	3.7725	1.7514	-1.6716	4.4701	-0.5966	1.1208	-0.2496
40.0	3.8659	2.4938	-2.4788	5.2122	-1.1119	1.6349	-0.3356
50.0	3.6282	3.2323	-3.2906	5.8546	-1.6559	2.1608	-0.4102
60.0	3.0353	3.8658	-3.9964	6.3208	-2.1587	2.5978	-0.4554
70.0	2.1761	4.3414	-4.5229	6.6223	-2.5799	2.9185	-0.4552
80.0	1.1081	4.5843	-4.7845	6.7036	-2.8657	3.0908	-0.4303
90.0	-0.0039	4.6780	-4.9031	6.7628	-3.0474	3.1902	-0.4727
100.0	-1.1046	4.5957	-4.8031	6.7243	-3.1020	3.1317	-0.4515
110.0	-2.1290	4.2744	-4.4301	6.4989	-3.0079	2.9046	-0.4130
120.0	-3.0258	3.8604	-3.9849	6.3054	-2.8460	2.5863	-0.4338
130.0	-3.6356	3.2376	-3.2930	5.8634	-2.5410	2.1568	-0.3883
140.0	-3.8911	2.5081	-2.4935	5.2447	-2.1277	1.5912	-0.3275
150.0	-3.7875	1.7598	-1.6785	4.4885	-1.6699	1.0459	-0.2456
160.0	-3.2993	1.0621	-0.9272	3.5768	-1.1888	0.5483	-0.1504
170.0	-2.6694	0.5131	-0.3669	2.7349	-0.7727	0.1863	-0.0646
180.0	-2.5088	0.0015	-0.0042	2.5088	-0.4086	-0.0470	0.0008
190.0	-2.6564	-0.5071	0.3563	2.7201	-0.1267	-0.2761	0.0672
200.0	-3.2672	-1.0474	0.9106	3.5390	0.1631	-0.6447	0.1571
210.0	-3.7282	-1.7320	1.6460	4.4158	0.5741	-1.1175	0.2593
220.0	-3.8308	-2.4709	2.4503	5.1619	1.0872	-1.6364	0.3506
230.0	-3.5967	-3.1981	3.2505	5.7940	1.6253	-2.1507	0.4308
240.0	-2.9837	-3.8021	3.9236	6.2113	2.1226	-2.5878	0.4896
250.0	-2.1249	-4.2476	4.4184	6.4729	2.5316	-2.8887	0.4913
260.0	-1.0824	-4.4835	4.6687	6.5480	2.8075	-3.0405	0.4803
270.0	0.0012	-4.5816	4.7827	6.6087	2.9958	-3.1298	0.5130
280.0	1.0863	-4.4960	4.6848	6.5687	3.0660	-3.0781	0.4941
290.0	2.0774	-4.1728	4.3215	6.3417	2.9618	-2.8336	0.4664
300.0	2.9776	-3.7893	3.9067	6.1899	2.8338	-2.5464	0.4651
310.0	3.5595	-3.1662	3.2108	5.7311	2.5179	-2.0770	0.4105
320.0	3.8201	-2.4623	2.4357	5.1430	2.1154	-1.5461	0.3430
330.0	3.7356	-1.7340	1.6441	4.4221	1.6687	-1.0188	0.2548
340.0	3.2461	-1.0442	0.9021	3.5162	1.1847	-0.5258	0.1545
350.0	2.6056	-0.5011	0.3476	2.6681	0.7711	-0.1625	0.0673
360.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000

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TABLE V - SPACE OPERATIONS CENTER FIFTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km.

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000
10.0	2.5590	0.4125	-0.3986	2.6158	0.1972	0.3097	-0.0777
20.0	2.9618	0.7912	-0.9388	3.1965	-0.0215	0.6538	-0.1634
30.0	3.3334	1.2685	-1.6644	3.9245	-0.2999	1.1196	-0.2697
40.0	3.3726	1.7665	-2.4378	4.5082	-0.6608	1.6065	-0.3565
50.0	3.1330	2.2528	-3.2079	5.0048	-1.0307	2.0914	-0.4399
60.0	2.5972	2.6620	-3.8558	5.3430	-1.3920	2.5069	-0.4922
70.0	1.8090	2.9163	-4.2470	5.4450	-1.6763	2.7242	-0.4588
80.0	0.9142	3.0572	-4.4602	5.4680	-1.8822	2.8725	-0.4448
90.0	-0.0047	3.1465	-4.6270	5.5803	-2.0495	3.0091	-0.5057
100.0	-0.9196	3.0898	-4.5252	5.5403	-2.1157	2.9533	-0.4883
110.0	-1.7960	2.9060	-4.2233	5.4165	-2.1050	2.7796	-0.4497
120.0	-2.5481	2.6252	-3.7800	5.2457	-2.0183	2.4971	-0.4190
130.0	-3.1333	2.2562	-3.2096	5.0074	-1.8863	2.0849	-0.4193
140.0	-3.3963	1.7799	-2.4576	4.5418	-1.6346	1.5625	-0.3528
150.0	-3.3686	1.2815	-1.6852	3.9673	-1.3457	1.0484	-0.2656
160.0	-3.0079	0.8034	-0.9543	3.2465	-1.0078	0.5643	-0.1622
170.0	-2.5780	0.4166	-0.4026	2.6355	-0.7308	0.2019	-0.0768
180.0	-2.5102	0.0013	-0.0041	2.5102	-0.4085	-0.0470	0.0008
190.0	-2.5685	-0.4130	0.3932	2.6245	-0.2004	-0.2931	0.0776
200.0	-3.0124	-0.7975	0.9467	3.2475	0.0145	-0.6555	0.1665
210.0	-3.3019	-1.2568	1.6436	3.8854	0.2883	-1.1200	0.2769
220.0	-3.3011	-1.7313	2.3800	4.4101	0.6323	-1.5921	0.3711
230.0	-3.0536	-2.2005	3.1199	4.8754	0.9947	-2.0599	0.4591
240.0	-2.5120	-2.5835	3.7228	5.1667	1.3426	-2.4511	0.5179
250.0	-1.7507	-2.8310	4.1060	5.2703	1.6251	-2.6842	0.5114
260.0	-0.8861	-2.9700	4.3161	5.2972	1.8347	-2.8118	0.4832
270.0	0.0024	-3.0647	4.4762	5.4089	2.0079	-2.9343	0.5336
280.0	0.8957	-2.9998	4.3756	5.3643	2.0775	-2.8809	0.5134
290.0	1.7228	-2.7963	4.0475	5.1968	2.0458	-2.6687	0.4724
300.0	2.4745	-2.5437	3.6558	5.0805	1.9864	-2.4084	0.4445
310.0	3.0287	-2.1821	3.0677	4.8309	1.8507	-1.9986	0.4357
320.0	3.2952	-1.7296	2.3689	4.3987	1.6140	-1.4970	0.3653
330.0	3.2804	-1.2513	1.6284	3.8587	1.3367	-1.0058	0.2755
340.0	2.9264	-0.7829	0.9169	3.1553	1.0006	-0.5500	0.1665
350.0	2.5216	-0.4087	0.3836	2.5765	0.7263	-0.1900	0.0778
360.0	2.5057	-0.0014	-0.0051	2.5057	0.4092	0.0495	0.0000

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_{FN}	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004
10.0	3.2303	0.4695	0.4927	3.2960	-0.2268	-0.1636	0.0018
20.0	3.4992	0.8807	1.0954	3.7882	-0.4171	-0.5647	0.0257
30.0	3.6581	1.3621	1.8145	4.2911	-0.6403	-1.0579	0.0857
40.0	3.5823	1.8436	2.5810	4.7734	-0.9352	-1.5779	0.1461
50.0	3.3700	2.3277	3.4462	5.3631	-1.3317	-2.1667	0.1708
60.0	2.7715	2.7877	4.0938	5.6628	-1.6822	-2.6153	0.1445
70.0	1.8906	3.0812	4.4439	5.6798	-1.8874	-2.8760	0.1505
80.0	0.9705	3.2032	4.7661	5.8122	-2.0643	-3.1452	0.2469
90.0	0.0003	3.2432	4.8535	5.8249	-2.1391	-3.2106	0.3546
100.0	-0.9695	3.1935	4.7345	5.7786	-2.1623	-3.1491	0.2301
110.0	-1.9145	3.0513	4.5047	5.7529	-2.1186	-3.0141	0.1968
120.0	-2.7397	2.7799	4.0724	5.6278	-1.9984	-2.7548	0.1957
130.0	-3.3770	2.3883	3.4476	5.3727	-1.8034	-2.3540	0.2619
140.0	-3.7926	1.9285	2.7278	5.0435	-1.4968	-1.8790	0.1347
150.0	-3.8723	1.4146	1.9348	4.5409	-1.1625	-1.3657	0.0919
160.0	-3.5629	0.8966	1.1167	3.8321	-0.7609	-0.8547	0.0406
170.0	-3.2567	0.4722	0.4975	3.3230	-0.3977	-0.4674	0.0660
180.0	-3.2666	0.0012	-0.0031	3.2666	-0.0155	-0.1538	0.0004
190.0	-3.2715	-0.4733	-0.4995	3.3379	0.2136	0.1787	-0.0085
200.0	-3.5969	-0.9005	-1.1291	3.8684	0.4338	0.5966	-0.0518
210.0	-3.6843	-1.3595	-1.8332	4.5245	0.6214	1.0747	-0.1079
220.0	-3.6504	-1.8714	-2.6491	4.8708	0.9556	1.6223	-0.1545
230.0	-3.4194	-2.4100	-3.5021	5.4443	1.3521	2.2040	-0.1865
240.0	-2.8193	-2.8360	-4.1806	5.7731	1.7064	2.6679	-0.1702
250.0	-1.9442	-3.0763	-4.5558	5.8178	1.9113	2.9556	-0.2156
260.0	-0.9951	-3.2684	-4.8730	5.9381	2.0891	3.1916	-0.2625
270.0	-0.0001	-3.3002	-4.9080	5.9005	2.1670	3.2237	-0.3677
280.0	0.9976	-3.2714	-4.8646	5.9328	2.1996	3.1871	-0.2531
290.0	1.9897	-3.1838	-4.6730	5.9602	2.1542	3.0936	-0.1795
300.0	2.8526	-2.8601	-4.2295	5.8568	2.0182	2.8627	-0.1512
310.0	3.4822	-2.4461	-3.5535	5.5326	1.7452	2.3861	-0.1564
320.0	3.8627	-1.9591	-2.8885	5.1408	1.4817	1.9108	-0.1090
330.0	3.9029	-1.4233	-2.0846	4.5787	1.1306	1.3815	-0.0707
340.0	3.6027	-0.9023	-1.1331	3.8753	0.7378	0.8710	-0.0281
350.0	3.2167	-0.4685	-0.4967	3.2851	0.4029	0.4726	-0.0070
360.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004

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TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004
10.0	3.2964	0.5771	-0.4427	3.3645	-0.5138	-0.1658	0.0860
20.0	3.8203	1.1705	1.0605	4.1250	-0.5864	-0.5476	0.0169
30.0	4.0813	1.8534	1.7968	4.8183	-0.9480	-1.0565	0.0754
40.0	4.0416	2.5731	2.5790	5.4290	-1.3975	-1.5864	0.1298
50.0	3.8278	3.3669	3.4713	6.1552	-1.9557	-2.1650	0.1545
60.0	3.2146	4.0405	4.2263	6.6602	-2.4687	-2.7134	0.1676
70.0	2.2133	4.3850	4.5823	6.7041	-2.7646	-2.9654	0.1464
80.0	1.1460	4.7535	4.9910	6.9610	-3.0661	-3.2805	0.1812
90.0	-0.0019	4.8980	5.1550	7.0482	-3.1675	-3.3618	0.2425
100.0	-1.1627	4.7513	5.0128	6.9911	-3.1911	-3.3177	0.2305
110.0	-2.2745	4.5033	4.7400	6.9100	-3.0911	-3.1519	0.2452
120.0	-3.1992	4.0312	4.2058	6.6457	-2.8500	-2.7421	0.2406
130.0	-3.9159	3.4353	3.5570	6.2855	-2.5104	-2.3960	0.1822
140.0	-4.2845	2.7040	2.7350	5.7459	-2.0224	-1.8732	0.1235
150.0	-4.2715	1.9257	1.8825	5.0391	-1.5068	-1.3271	0.0804
160.0	-3.8798	1.1884	1.0779	4.1895	-0.9656	-0.8278	0.0524
170.0	-3.3397	0.5015	0.4491	3.4136	-0.4505	-0.4442	-0.0010
180.0	-3.2680	0.0014	-0.0030	3.2680	-0.0156	-0.1538	0.0004
190.0	-3.3493	-0.5832	-0.4498	3.4233	0.2990	0.1520	-0.0001
200.0	-3.8739	-1.1813	-1.0779	4.1824	0.8004	0.5570	-0.0212
210.0	-4.1675	-1.8810	-1.8375	4.9174	0.9659	1.0780	-0.0852
220.0	-4.1192	-2.6155	-2.6430	5.5375	1.4042	1.6244	-0.1473
230.0	-3.8484	-3.3815	-3.4906	6.1870	1.9340	2.2075	-0.1998
240.0	-3.2595	-4.0814	-4.2868	6.7454	2.4780	2.7467	-0.2027
250.0	-2.2644	-4.4656	-4.7018	6.8561	2.8058	3.0525	-0.2150
260.0	-1.1761	-4.7959	-5.0922	7.0041	3.0960	3.3280	-0.2141
270.0	0.0012	-4.9195	-5.2259	7.1654	3.2243	3.4421	-0.2557
280.0	1.1877	-4.8351	-5.1212	7.1302	3.2353	3.3614	-0.2483
290.0	2.3202	-4.5658	-4.8205	7.0211	3.1088	3.1644	-0.2315
300.0	3.2790	-4.1054	-4.3111	6.7870	2.8656	2.8478	-0.1969
310.0	3.9360	-3.4860	-3.6140	6.4060	2.5044	2.4394	-0.1419
320.0	4.3623	-2.7445	-2.7926	5.8506	2.0244	1.9089	-0.1040
330.0	4.5357	-1.9463	-1.9175	5.1147	1.4481	1.3537	-0.0663
340.0	3.8852	-1.1854	-1.0820	4.1950	0.8548	0.8270	-0.0230
350.0	3.3064	-0.5780	-0.4479	3.3782	0.4705	0.4343	0.0009
360.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2607	-0.0014	-0.0042	3.2607	0.0165	0.1553	-0.0004
10.0	3.4081	0.6799	0.3851	3.4896	-0.3405	-0.0912	-0.0126
20.0	4.0980	1.8498	0.9545	4.4396	-0.8043	-0.4735	-0.0039
30.0	4.4511	3.1844	1.6430	5.2817	-1.3050	-0.9495	0.0370
40.0	4.4771	3.3202	2.4066	6.0587	-1.8757	-1.4782	0.0996
50.0	4.1729	4.3077	3.1480	6.7791	-2.5474	-2.0151	0.1384
60.0	3.5660	5.2668	3.9490	7.8737	-3.2539	-2.5386	0.1501
70.0	2.5486	5.8871	4.4355	7.7871	-3.7349	-2.8890	0.1721
80.0	1.2881	6.2291	4.7030	7.8998	-4.0846	-3.0970	0.1855
90.0	-0.0028	6.4023	4.8426	8.0172	-4.2232	-3.1989	0.1769
100.0	-1.3147	6.2818	4.7471	7.9716	-4.2046	-3.1321	0.2216
110.0	-2.5527	5.8828	4.4804	7.8500	-4.0378	-2.9393	0.2485
120.0	-3.6047	5.3097	3.9824	7.5417	-3.7065	-2.6522	0.2252
130.0	-4.3610	4.4717	3.3221	7.0630	-3.2002	-2.2304	0.1633
140.0	-4.7292	3.4796	2.5398	6.3855	-2.5538	-1.7425	0.1051
150.0	-4.5594	2.3998	1.6846	5.4891	-1.8018	-1.1986	0.0538
160.0	-4.1834	1.4715	0.9754	4.5311	-1.1143	-0.7648	0.0089
170.0	-3.4451	0.6818	0.3886	3.5248	-0.5186	-0.4047	-0.0063
180.0	-3.2600	0.0014	-0.0031	3.2600	-0.0156	-0.1541	0.0004
190.0	-3.4561	-0.6856	-0.3919	3.5385	0.5625	0.1188	0.0081
200.0	-4.1041	-1.4442	-0.9577	4.4456	0.7757	0.4830	-0.0091
210.0	-4.4641	-2.3486	-1.6460	5.2945	1.2961	0.9586	-0.0511
220.0	-4.5209	-3.3420	-2.4273	6.1117	1.8663	1.4963	-0.1272
230.0	-4.1790	-4.3033	-3.1908	6.7825	2.5158	2.0225	-0.1788
240.0	-3.5721	-5.2482	-3.9500	7.4665	3.2276	2.5459	-0.1876
250.0	-2.5544	-5.8488	-4.4177	7.7455	3.7016	2.8777	-0.2120
260.0	-1.3086	-6.2361	-4.7340	7.9284	4.0359	3.1100	-0.2414
270.0	0.0025	-6.4098	-4.8784	8.0459	4.2168	3.2092	-0.2171
280.0	1.3331	-6.3318	-4.8092	8.0523	4.2336	3.1683	-0.2371
290.0	2.5198	-5.9482	-4.5051	7.8852	4.0847	2.9557	-0.2575
300.0	3.6420	-5.3434	-4.0230	7.6052	3.7086	2.6591	-0.2056
310.0	4.4012	-4.4963	-3.3540	7.1189	3.1871	2.2556	-0.1562
320.0	4.7413	-3.4819	-2.5537	6.4015	2.5376	1.7551	-0.0903
330.0	4.5951	-2.4088	-1.7022	5.4491	1.7876	1.2043	-0.0459
340.0	4.1477	-1.4585	-0.9700	4.4929	1.1155	0.7474	-0.0124
350.0	3.4401	-0.6423	-0.3929	3.5224	0.5310	0.3606	0.0055
360.0	3.2607	-0.0014	-0.0042	3.2607	0.0165	0.1553	-0.0004

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TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2572	-0.0015	-0.0042	3.2572	0.0167	0.1548	-0.0004
10.0	3.4909	0.7631	-0.3078	3.5793	-0.4371	-0.0433	-0.0164
20.0	4.3110	1.6821	0.7834	4.6831	-0.9453	-0.3576	-0.0117
30.0	4.7555	2.7833	1.3708	5.6662	-1.6011	-0.7744	0.0094
40.0	4.8191	3.9794	2.0130	6.5537	-2.3510	-1.2161	0.0415
50.0	4.4604	5.1448	2.6465	7.2967	-3.0849	-1.6600	0.0961
60.0	3.7798	6.2557	3.2542	7.9929	-3.6975	-2.0898	0.1044
70.0	2.7395	7.1056	3.7269	8.4705	-4.5229	-2.4189	0.1248
80.0	1.3889	7.4954	3.9303	8.5659	-4.6713	-2.5684	0.1560
90.0	-0.0037	7.6963	4.0430	8.6814	-5.0726	-2.6707	0.1474
100.0	-1.4250	7.6123	4.0079	8.7131	-5.0829	-2.6374	0.2034
110.0	-2.7404	7.1301	3.7456	8.4995	-4.8275	-2.4470	0.2259
120.0	-3.8912	6.4059	3.3495	8.2003	-4.4293	-2.2117	0.1865
130.0	-4.6648	5.3458	2.7715	7.6064	-3.7737	-1.8698	0.1160
140.0	-4.9655	4.0872	2.0785	6.7470	-2.9322	-1.4390	0.0634
150.0	-4.8211	2.8207	1.3897	5.7439	-2.0726	-1.0030	0.0365
160.0	-4.3706	1.7018	0.7947	4.7470	-1.2740	-0.6438	-0.0006
170.0	-3.5181	0.7686	0.3090	3.6070	-0.5667	-0.3517	-0.0113
180.0	-3.2614	0.0012	-0.0031	3.2614	-0.0155	-0.1541	0.0004
190.0	-3.5687	-0.7745	-0.3166	3.6584	0.4232	0.0639	0.0094
200.0	-4.3201	-1.6816	-0.7867	4.6921	0.9212	0.3699	0.0055
210.0	-4.7641	-2.7827	-1.3733	5.6741	1.5954	0.7756	-0.0166
220.0	-4.8756	-4.0097	-2.0363	6.6214	2.3471	1.2443	-0.0681
230.0	-4.4946	-5.1616	-2.6670	7.3347	3.0717	1.6822	-0.1315
240.0	-3.8112	-6.2681	-3.2834	8.0283	3.8797	2.1060	-0.1380
250.0	-2.7459	-7.0906	-3.7361	8.4652	4.5095	2.4276	-0.1516
260.0	-1.4001	-7.4771	-3.9474	8.5636	4.8407	2.5946	-0.2047
270.0	0.0036	-7.3073	-4.0627	8.7160	5.0661	2.6825	-0.1660
280.0	1.4341	-7.6154	-4.0292	8.7277	5.0313	2.6464	-0.2214
290.0	2.7603	-7.1337	-3.7640	8.5178	4.8317	2.4610	-0.2377
300.0	3.9086	-6.4085	-3.3622	8.2165	4.4248	2.2231	-0.1721
310.0	4.6921	-5.3602	-2.7405	7.6410	3.7757	1.8822	-0.1160
320.0	5.0032	-4.1040	-2.0982	6.7914	2.9408	1.4523	-0.0581
330.0	4.8744	-2.8395	-1.4090	5.8031	2.0775	1.0132	-0.0263
340.0	4.3518	-1.6944	-0.7949	4.7268	1.2453	0.6368	-0.0020
350.0	3.5222	-0.7673	-0.3146	3.6113	0.5852	0.3404	0.0102
360.0	3.2572	-0.0015	-0.0042	3.2572	0.0167	0.1548	-0.0004

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TABLE VI - SPACE OPERATIONS CENTER ST[illegible] STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON [illegible]LY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

e) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2605	-0.0014	-0.0041	3.2605	0.0165	0.1553	-0.0004
10.0	3.5923	0.8339	0.2183	3.6867	-0.4747	0.0120	-0.0169
20.0	4.3922	1.8413	0.5443	4.7889	-1.0697	-0.2100	-0.0287
30.0	4.9993	3.1398	0.9891	5.9727	-1.8558	-0.5177	-0.0221
40.0	5.0458	4.4826	1.4456	6.8904	-2.6996	-0.8499	0.0012
50.0	4.7102	5.8424	1.9116	7.7380	-3.5804	-1.1802	0.0319
60.0	3.9367	7.0313	2.3212	8.3779	-4.3884	-1.4808	0.0703
70.0	2.8499	7.9988	2.6617	8.8889	-5.0949	-1.7257	0.0824
80.0	1.4765	8.5613	2.8309	9.0770	-5.5216	-1.8595	0.1141
90.0	-0.0032	8.6699	2.8916	9.1359	-5.7011	-1.9049	0.1069
100.0	-1.4956	8.5769	2.8656	9.1619	-5.7015	-1.8832	0.1434
110.0	-2.8596	8.0229	2.6708	8.9213	-5.4168	-1.7807	0.1234
120.0	-4.0310	7.1676	2.3826	8.5541	-4.9086	-1.5754	0.1125
130.0	-4.7996	5.9407	1.9539	7.8738	-4.1812	-1.3238	0.0676
140.0	-5.1401	4.5563	1.4727	7.0133	-3.2351	-1.0369	0.0292
150.0	-5.0331	3.1608	0.9910	6.0129	-2.2648	-0.7539	-0.0067
160.0	-4.4413	1.8604	0.5491	4.8356	-1.3543	-0.4874	-0.0194
170.0	-3.5981	0.8378	0.2162	3.6929	-0.6171	-0.2893	-0.0148
180.0	-3.2614	0.0012	-0.0031	3.2614	-0.0155	-0.1541	0.0004
190.0	-3.6458	-0.8816	-0.2282	3.7418	0.4630	0.0027	0.0135
200.0	-4.4226	-1.8489	-0.5492	4.8143	1.0425	0.2201	0.0190
210.0	-4.9717	-3.1161	-0.9790	5.9371	1.8120	0.5193	0.0091
220.0	-5.1121	-4.5217	-1.4635	6.9689	2.7037	0.8671	-0.0170
230.0	-4.7126	-5.8277	-1.9115	7.7250	3.5403	1.1870	-0.0591
240.0	-3.9418	-7.0033	-2.3246	8.3587	4.3391	1.4858	-0.1022
250.0	-2.8598	-7.9804	-2.6665	8.8819	5.0722	1.7288	-0.1148
260.0	-1.4907	-8.5033	-2.8491	9.0874	5.5696	1.8700	-0.1519
270.0	0.0032	-8.7149	-2.9283	9.1909	5.7247	1.9230	-0.1513
280.0	1.5065	-8.5992	-2.8907	9.1930	5.7291	1.9012	-0.1557
290.0	2.8864	-8.0398	-2.6695	8.9508	5.4392	1.7610	-0.1730
300.0	4.0489	-7.1691	-2.3926	8.5672	4.9306	1.5910	-0.1117
310.0	4.8380	-5.9641	-1.9704	7.9192	4.1656	1.3379	-0.0643
320.0	5.2103	-4.5978	-1.4955	7.0971	3.2537	1.0514	-0.0243
330.0	5.0500	-3.1888	-0.9982	6.0287	2.2899	0.7478	-0.0002
340.0	4.4680	-1.8660	-0.5566	4.8636	1.3857	0.4755	0.0122
350.0	3.5990	-0.8349	-0.2227	3.6937	0.6326	0.2662	0.0138
360.0	3.2605	-0.0014	-0.0041	3.2605	0.0165	0.1553	-0.0004

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2601	-0.0014	-0.0040	3.2601	0.0165	0.1552	-0.0004
10.0	3.6389	0.6701	0.1179	3.7369	-0.4970	0.0736	-0.0244
20.0	4.4873	1.9558	0.2836	4.6922	-1.1312	-0.0433	-0.0373
30.0	5.0608	3.3162	0.5081	6.0597	-1.9722	-0.2099	-0.0436
40.0	5.2053	4.7144	0.7590	7.1196	-2.9221	-0.3999	-0.0389
50.0	4.8309	6.2505	0.9995	7.9534	-3.8807	-0.5856	-0.0246
60.0	4.0588	7.5532	1.2196	8.6546	-4.7508	-0.7641	0.0139
70.0	2.9064	8.5259	1.3886	9.1104	-5.4374	-0.8936	0.0393
80.0	1.5159	9.1212	1.4858	9.3632	-5.9197	-0.9732	0.0610
90.0	-0.0020	9.2829	1.5119	9.4047	-6.0904	-0.9958	0.0669
100.0	-1.5222	9.1460	1.4916	9.3894	-6.0806	-0.9811	0.0842
110.0	-2.9151	8.5560	1.3964	9.1426	-5.7587	-0.9181	0.0786
120.0	-4.0841	7.5994	1.2306	8.7063	-5.1851	-0.8295	0.0418
130.0	-4.9016	6.3343	1.0155	8.0642	-4.3726	-0.7222	-0.0027
140.0	-5.2841	4.8833	0.7713	7.2251	-3.4314	-0.5900	-0.0224
150.0	-5.1253	3.3586	0.5128	6.1369	-2.3659	-0.4438	-0.0331
160.0	-4.5442	1.9794	0.2664	4.9529	-1.4361	-0.3151	-0.0291
170.0	-3.6533	0.8816	0.1127	3.7519	-0.8406	-0.2195	-0.0170
180.0	-3.2640	0.0011	-0.0031	3.2640	-0.0154	-0.1534	0.0004
190.0	-3.7012	-0.8856	-0.1193	3.7999	0.4901	-0.0663	0.0172
200.0	-4.4910	-1.9557	-0.2868	4.8963	1.1104	0.0465	0.0328
210.0	-5.0676	-3.3175	-0.5086	6.0664	1.9448	0.2134	0.0365
220.0	-5.2409	-4.8351	-0.7629	7.1605	2.9046	0.4115	0.0220
230.0	-4.8505	-6.2608	-1.0004	7.9736	3.8524	0.5908	0.0087
240.0	-4.0552	-7.5218	-1.2170	8.6256	4.7164	0.7614	-0.0227
250.0	-2.9177	-8.5198	-1.4038	9.1008	5.4128	0.8952	-0.0575
260.0	-1.5267	-9.1201	-1.4907	9.3649	5.8928	0.9740	-0.0841
270.0	0.0009	-9.3230	-1.5284	9.4466	6.1129	1.0016	-0.0994
280.0	1.5375	-9.1741	-1.5068	9.4219	6.1048	0.9908	-0.0868
290.0	2.9366	-8.5557	-1.4037	9.1508	5.7760	0.9290	-0.0695
300.0	4.0918	-7.5753	-1.2521	8.6917	5.1799	0.8313	-0.0597
310.0	4.8995	-6.3112	-1.0136	8.0451	4.3794	0.7136	-0.0045
320.0	5.2975	-4.8801	-0.7765	7.2338	3.4418	0.5850	0.0162
330.0	5.1266	-3.3479	-0.5158	6.1529	2.4067	0.4328	0.0264
340.0	4.5452	-1.9705	-0.2920	4.9427	1.4475	0.3002	0.0259
350.0	3.6451	-0.8270	-0.1194	3.7455	0.6655	0.2152	0.0170
360.0	3.2601	-0.0014	-0.0040	3.2601	0.0165	0.1552	-0.0004

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TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2596	-0.0013	-0.0039	3.2596	0.0165	0.1552	-0.0004
10.0	3.6515	[illegible]	-0.0040	3.7503	-0.5193	0.1512	-0.0242
20.0	4.5504	[illegible]	-0.0047	[illegible]	-1.[illegible]	0.1390	-0.0448
30.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40.0	5.1819	4.8620	-0.0058	7.0947	-2.9413	0.0969	-0.0696
50.0	[illegible]	[illegible]	-0.0060	[illegible]	-3.8945	0.0704	-0.0678
60.0	4.0396	[illegible]	[illegible]	[illegible]	-4.7917	0.0489	-0.0580
70.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
80.0	1.5235	9.2778	-0.0048	9.4012	-6.0126	0.0075	-0.0114
90.0	0.0010	9.5384	-0.0038	9.5388	-6.2506	0.0040	0.0066
100.0	-1.8223	[illegible]	[illegible]	[illegible]	-6.1575	-0.0095	-0.0080
110.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
120.0	-4.0636	7.6792	-0.0026	8.6821	-5.2251	-0.0352	-0.0452
130.0	[illegible]	[illegible]	-0.0027	[illegible]	[illegible]	[illegible]	[illegible]
140.0	-5.2761	[illegible]	-0.0029	[illegible]	-3.[illegible]	-0.0846	-0.0612
150.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
160.0	-4.5535	2.0106	-0.0038	4.9665	-1.43[illegible]	-0.1227	-0.0398
170.0	-3.6562	[illegible]	-0.0037	3.7559	[illegible]	[illegible]	[illegible]
180.0	-3.2648	[illegible]	-0.0031	3.2648	[illegible]	[illegible]	[illegible]
190.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
200.0	-4.5471	-2.0052	-0.0023	4.9586	1.1602	-0.1417	0.0455
210.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
220.0	-5.2264	-4.9037	[illegible]	[illegible]	2.9458	[illegible]	[illegible]
230.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
240.0	-4.0519	-7.6361	-0.0037	8.6389	4.7673	-0.0561	0.0462
250.0	-2.9182	-8.6439	-0.0035	9.1206	5.4965	-0.0172	0.0311
260.0	-1.5275	-9.2384	-0.0041	9.3652	5.9644	-0.0055	0.0050
270.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
280.0	1.5246	-9.2352	-0.0050	9.3596	6.1555	0.0070	0.0053
290.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
300.0	4.0571	-7.6331	-0.0052	8.6389	5.2276	0.0366	0.0442
310.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
320.0	5.2808	-4.9816	-0.0048	7.2217	3.4636	0.0859	0.0599
330.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
340.0	4.5537	-2.0068	-0.0044	4.9654	1.4521	0.1246	0.0385
350.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
360.0	3.2596	-0.0013	-0.0039	3.2596	0.0165	0.1552	-0.0004

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

h) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2594	-0.0013	-0.0039	3.2594	0.0165	0.1551	-0.0004
10.0	3.6405	0.8761	-0.1189	3.7385	-0.8741	0.0643	-0.0266
20.0	4.4987	1.9601	-0.2902	4.9048	-1.1102	0.3201	-0.0526
30.0	5.0884	3.3329	-0.5173	6.0926	-1.9580	0.4496	-0.0784
40.0	5.2314	4.8354	-0.7726	7.1545	-2.9155	0.6005	-0.1066
50.0	4.8900	6.3171	-1.0216	8.0446	-3.9048	0.7378	-0.1387
60.0	4.1194	7.6499	-1.2484	8.7716	-4.8072	0.8573	-0.1189
70.0	2.9457	8.6231	-1.4163	9.2183	-5.6088	0.9478	-0.1117
80.0	1.5305	9.1829	-1.5068	9.4293	-5.9408	0.9924	-0.0930
90.0	0.0058	9.2310	-1.5086	9.3526	-6.0278	0.9819	-0.0708
100.0	-1.5197	9.1021	-1.4831	9.3018	-6.0394	0.9628	-0.0887
110.0	-2.9092	8.5419	-1.3926	9.1269	-5.7394	0.8906	-0.1059
120.0	-4.0662	7.5705	-1.2233	8.6745	-5.1468	0.7625	-0.1098
130.0	-4.8846	6.3176	-1.0155	8.0407	-4.4510	0.6036	-0.1062
140.0	-5.2677	4.8725	-0.7725	7.2058	-3.4159	0.4189	-0.0967
150.0	-5.1153	3.3537	-0.5161	6.1261	-2.3807	0.2328	-0.0721
160.0	-4.5436	1.9794	-0.2915	4.9536	-1.4351	0.0867	-0.0491
170.0	-3.6598	0.8827	-0.1178	3.7587	-0.6487	-0.0705	-0.0262
180.0	-3.2640	0.0011	-0.0031	3.2640	-0.0154	-0.1539	0.0004
190.0	-3.7015	-0.8864	0.1149	3.8003	0.4898	-0.2165	0.0264
200.0	-4.5140	-1.9646	0.2866	4.9205	1.1226	-0.3305	0.0565
210.0	-5.0951	-3.3321	0.5101	6.0974	1.9542	-0.4445	0.0656
220.0	-5.2825	-4.8701	0.7680	7.2151	2.9227	-0.5942	0.1049
230.0	-4.8876	-6.3122	1.0080	8.0440	3.8828	-0.7335	0.1239
240.0	-4.0829	-7.5673	1.2225	8.6791	4.7204	-0.8405	0.1245
250.0	-2.9407	-8.5701	1.3969	9.1644	5.4408	-0.9360	0.1194
260.0	-1.5297	-9.1280	1.4878	9.3726	5.8803	-0.9815	0.1086
270.0	-0.0036	-9.2171	1.4955	9.3367	6.0238	-0.9782	0.0956
280.0	1.5182	-9.0739	1.4739	9.3158	6.0390	-0.9606	0.1105
290.0	2.9081	-8.4863	1.3806	8.9731	5.7270	-0.8860	0.1169
300.0	4.0405	-7.4965	1.2101	8.5956	5.1257	-0.7554	0.1168
310.0	4.8844	-6.2888	1.0056	8.0175	4.3643	-0.5887	0.1164
320.0	5.2762	-4.8589	0.7674	7.2031	3.4114	-0.4119	0.0992
330.0	5.1171	-3.3811	0.5110	6.1210	2.3849	-0.2225	0.0753
340.0	4.5261	-1.9678	0.2865	4.9329	1.4267	-0.0597	0.0489
350.0	3.6493	-0.8782	0.1141	3.7878	0.6457	0.0703	0.0248
360.0	3.2594	-0.0013	-0.0039	3.2594	0.0165	0.1551	-0.0004

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TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 289.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2592	-0.0013	-0.0038	3.2592	0.0165	0.1551	-0.0004
10.0	3.5842	0.8355	-0.2235	3.6839	-0.8546	0.2888	-0.0277
20.0	4.4082	1.8475	-0.5684	4.6987	-1.8493	0.4907	-0.0592
30.0	5.0763	3.1005	-0.8008	5.8181	-3.1007	0.7668	-0.0809
40.0	5.1717	4.5778	-1.4907	7.0545	-2.7548	1.0690	-0.1372
50.0	4.8366	5.8760	-1.9774	7.9287	-3.6756	1.3690	-0.1698
60.0	4.0787	7.4000	-2.4133	8.6304	-4.7188	1.6212	-0.1816
70.0	2.8856	8.4838	-2.7440	9.0000	-5.3140	1.7828	-0.1800
80.0	1.5005	8.5829	-2.8755	9.1717	-5.5164	1.8788	-0.1668
90.0	0.0088	8.5534	-2.8578	9.0148	-5.5773	1.8583	-0.1600
100.0	-1.4750	8.4264	-2.8087	9.0001	-5.5908	1.8261	-0.1709
110.0	-3.0304	8.0847	-2.6463	8.8426	-5.3627	1.7083	-0.1833
120.0	-3.9555	7.0486	-2.3347	8.4053	-4.8108	1.4875	-0.1661
130.0	-4.7434	5.8769	-1.9245	7.7822	-4.0825	1.2028	-0.1508
140.0	-5.1212	4.5382	-1.4646	6.9862	-3.2078	0.8883	-0.1257
150.0	-5.0305	3.1587	-0.9940	6.0105	-2.2607	0.5437	-0.0838
160.0	-4.4286	1.8549	-0.5525	4.8223	-1.3509	0.2341	-0.0557
170.0	-3.5961	0.8362	-0.2218	3.6851	-0.6158	-0.0018	-0.0273
180.0	-3.2666	0.0012	-0.0031	3.2666	-0.0155	-0.1538	0.0004
190.0	-3.4558	-0.8448	0.2243	3.7014	0.6056	-0.2877	0.0285
200.0	-4.4646	-1.8647	0.5534	4.8593	1.0539	-0.5089	0.0670
210.0	-5.0333	-3.1503	0.9905	6.0085	1.8334	-0.7741	0.1048
220.0	-5.1679	-4.5675	1.4787	7.0427	2.7087	-1.0524	0.1440
230.0	-4.8167	-5.8437	1.9546	7.8866	3.6088	-1.3586	0.1829
240.0	-4.0372	-7.1501	2.3753	8.5408	4.4283	-1.5971	0.2057
250.0	-2.8781	-8.0266	2.6749	8.9316	5.0524	-1.7664	0.2124
260.0	-1.4899	-8.5090	2.8430	9.0905	5.4683	-1.8681	0.2062
270.0	-0.0053	-8.5174	2.8363	8.9738	5.5610	-1.8550	0.1997
280.0	1.4580	-8.3828	2.7915	8.9508	5.5859	-1.8229	0.2067
290.0	2.8178	-7.8777	2.6196	8.7618	5.4408	-1.6943	0.2121
300.0	3.9423	-7.0019	2.3219	8.5569	4.8187	-1.4824	0.1892
310.0	4.7202	-5.8374	1.9165	7.7381	4.0864	-1.1961	0.1658
320.0	5.1167	-4.5242	1.4628	6.9738	3.2179	-0.8735	0.1342
330.0	5.0362	-3.1481	0.9906	6.0104	2.2685	-0.5351	0.0967
340.0	4.4558	-1.8615	0.5512	4.8498	1.3609	-0.2266	0.0585
350.0	3.5937	-0.8350	0.2173	3.6882	0.6134	0.0075	0.0263
360.0	3.2592	-0.0013	-0.0038	3.2592	0.0165	0.1551	-0.0004

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004
10.0	3.5097	0.7661	-0.3152	3.5989	-0.8154	0.3467	-0.0275
20.0	4.3478	1.6937	-0.7970	4.7235	-0.9280	0.6532	-0.0714
30.0	4.8659	2.8387	-1.4106	5.7957	-1.6388	1.0362	-0.1160
40.0	4.9869	4.0985	-2.0955	6.7750	-2.4421	1.4675	-0.1654
50.0	4.6686	5.3428	-2.7789	7.6096	-3.2391	1.8886	-0.2122
60.0	3.9035	6.4067	-3.3569	8.2103	-3.9571	2.2253	-0.2298
70.0	2.7732	7.1693	-3.7746	8.5563	-4.5058	2.4669	-0.2359
80.0	1.4143	7.5163	-3.9569	8.6069	-4.8031	2.5743	-0.2341
90.0	0.0071	7.5963	-4.0053	8.5811	-4.9554	2.6088	-0.2351
100.0	-1.3935	7.4416	-3.9150	8.5162	-4.9368	2.5442	-0.2438
110.0	-2.7236	7.0506	-3.7018	8.4085	-4.7676	2.3918	-0.2555
120.0	-3.8245	6.2987	-3.2905	8.0610	-4.3218	2.1017	-0.2334
130.0	-4.5476	5.2219	-2.6955	7.4197	-3.6779	1.7071	-0.2029
140.0	-4.8729	4.0121	-2.0337	6.6198	-2.8775	1.2628	-0.1509
150.0	-4.7813	2.7989	-1.3762	5.6950	-2.0828	0.8026	-0.1094
160.0	-4.3479	1.6935	-0.7953	4.7232	-1.2682	0.3902	-0.0695
170.0	-3.5057	0.7669	-0.3121	3.5948	-0.5654	0.0593	-0.0269
180.0	-3.2666	0.0012	-0.0031	3.2666	-0.0155	-0.1538	0.0004
190.0	-3.5739	-0.7753	0.3126	3.6633	0.0285	-0.3508	0.0296
200.0	-4.3564	-1.6942	0.7919	4.7328	0.9294	-0.5654	0.0774
210.0	-4.8126	-2.8101	1.3874	5.7315	1.5773	-1.0247	0.1316
220.0	-5.0041	-4.1044	2.0931	6.7908	2.3972	-1.4560	0.1776
230.0	-4.6880	-5.3145	2.7543	7.5656	3.1808	-1.8713	0.2370
240.0	-3.8577	-6.3380	3.3114	8.1162	3.8678	-2.1947	0.2693
250.0	-2.7393	-7.0961	3.7304	8.4643	4.4473	-2.4548	0.2851
260.0	-1.4040	-7.4611	3.9229	8.5386	4.7765	-2.5723	0.2922
270.0	-0.0038	-7.5356	3.9596	8.5058	4.9169	-2.5857	0.2766
280.0	1.3829	-7.4039	3.8879	8.4690	4.9469	-2.5419	0.2868
290.0	2.6785	-6.9887	3.6408	8.2815	4.7383	-2.3623	0.2968
300.0	3.7676	-6.2065	3.2367	7.9401	4.3187	-2.0766	0.2711
310.0	4.5288	-5.1948	2.6843	7.3872	3.6824	-1.7054	0.2153
320.0	4.8519	-3.9957	2.0298	6.5933	2.8872	-1.2534	0.1622
330.0	4.7294	-2.7921	1.3762	5.6921	2.0627	-0.7987	0.1159
340.0	4.3451	-1.6906	0.7885	4.7186	1.2607	-0.3811	0.0678
350.0	3.4991	-0.7642	0.3068	3.5874	0.3664	-0.0456	0.0264
360.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004

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TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004
10.0	3.4370	0.6834	-0.3447	3.5107	-0.4587	0.3491	-0.0260
20.0	4.1521	1.4613	-0.9748	4.4987	-0.7898	0.7686	-0.0729
30.0	4.6002	2.4120	-1.7070	5.4568	-1.3650	1.2317	-0.1202
40.0	4.7398	3.4808	-2.5537	6.3998	-2.0254	1.7670	-0.1666
50.0	4.3794	4.4791	-3.3396	7.0873	-2.6890	2.2475	-0.2086
60.0	3.6475	5.3523	-4.0790	7.6178	-3.2746	2.6534	-0.2581
70.0	2.5931	6.0771	-4.6266	7.9235	-3.7381	2.9548	-0.2668
80.0	1.3101	6.2410	-4.7231	7.9253	-3.9829	3.0725	-0.2671
90.0	0.0054	6.2112	-4.7848	7.9101	-4.1161	3.1132	-0.2843
100.0	-1.2996	6.2245	-4.7151	7.9061	-4.1346	3.0642	-0.2875
110.0	-2.5475	5.8818	-4.4435	7.7891	-3.9887	2.8702	-0.2972
120.0	-3.5428	5.2197	-3.9186	7.4155	-3.6257	2.4994	-0.2987
130.0	-4.2145	4.3344	-3.2037	6.8298	-3.1253	2.0429	-0.2642
140.0	-4.6091	3.3965	-2.4727	6.2247	-2.5004	1.5425	-0.1915
150.0	-4.4478	2.3627	-1.6847	5.3233	-1.7487	0.9851	-0.1256
160.0	-4.1198	1.4512	-0.9614	4.4629	-1.1043	0.5052	-0.0713
170.0	-3.4223	0.6791	-0.3897	3.5041	-0.5178	0.1108	-0.0278
180.0	-3.2680	0.0014	-0.0030	3.2680	-0.0156	-0.1538	0.0004
190.0	-3.4781	-0.6078	0.3907	3.5603	0.3636	-0.4030	0.0304
200.0	-4.1361	-1.4540	0.9623	4.4792	0.7831	-0.7770	0.0609
210.0	-4.5543	-2.3906	1.6831	5.4007	1.1001	-1.2417	0.1067
220.0	-4.6904	-3.4484	2.5207	6.3324	1.9551	-1.7405	0.2143
230.0	-4.3215	-4.4286	3.2890	6.9068	2.5057	-2.2115	0.2734
240.0	-3.5835	-5.2713	3.9573	7.4916	3.1660	-2.6228	0.3188
250.0	-2.5573	-5.9102	4.4701	7.8290	3.6935	-2.9468	0.3288
260.0	-1.3001	-6.1909	4.6795	7.8562	3.9501	-3.0654	0.3296
270.0	-0.0026	-6.2720	4.7454	7.8552	4.0943	-3.1037	0.3282
280.0	1.2895	-6.1746	4.6931	7.8343	4.1333	-3.0533	0.3308
290.0	2.4808	-5.7558	4.3534	7.6084	3.9364	-2.8145	0.3273
300.0	3.5230	-5.1878	3.8901	7.3665	3.6378	-2.4978	0.3160
310.0	4.1962	-4.3123	3.1922	6.7895	3.1165	-2.0604	0.2700
320.0	4.5786	-3.3775	2.4618	6.1875	2.4942	-1.5313	0.1949
330.0	4.4768	-2.3580	1.6886	5.3116	1.7350	-0.9761	0.1303
340.0	4.1156	-1.4469	0.9556	4.4570	1.0907	-0.4859	0.0703
350.0	3.8005	-0.6774	0.3619	3.4815	0.5088	-0.0911	0.0274
360.0	3.2589	-0.0013	-0.0037	3.2589	0.0165	0.1550	-0.0004

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km .

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2607	-0.0014	-0.0042	3.2607	0.0165	0.1553	-0.0004
10.0	3.3202	0.5811	-0.4520	3.3946	-0.2964	0.0415	-0.0264
20.0	3.9081	1.1925	-1.0917	4.2206	-0.6152	0.0506	-0.0762
30.0	4.3271	1.8443	-1.9154	5.1058	-1.0463	1.3742	-0.1372
40.0	4.3377	2.7322	-2.7762	5.8186	-1.5524	1.9041	-0.1876
50.0	3.9922	3.4688	-3.6105	6.4046	-2.0562	2.4187	-0.2356
60.0	3.3063	4.1434	-4.3470	6.8434	-2.5128	2.8624	-0.2649
70.0	2.3496	4.6125	-4.8722	7.0967	-2.8690	3.1726	-0.2444
80.0	1.1787	4.8044	-5.0757	7.0734	-3.0655	3.3027	-0.2650
90.0	0.0041	4.8875	-5.1857	7.1140	-3.1845	3.3740	-0.2945
100.0	-1.1776	4.8291	-5.1149	7.1199	-3.2089	3.3327	-0.2651
110.0	-2.2580	4.4613	-4.6772	6.8338	-3.0323	3.0454	-0.2454
120.0	-3.1948	4.0162	-4.1952	6.6162	-2.8158	2.6915	-0.2952
130.0	-3.8167	3.3594	-3.4517	6.1360	-2.4845	2.2114	-0.2860
140.0	-4.2170	2.6691	-2.6933	5.6594	-2.0066	1.6779	-0.2075
150.0	-4.2128	1.8016	-1.8543	4.9697	-1.4846	1.1055	-0.1443
160.0	-3.8446	1.1778	-1.0672	4.1512	-0.9310	0.5696	-0.0760
170.0	-3.3227	0.5805	-0.4497	3.3968	-0.4493	0.1461	-0.0266
180.0	-3.2600	0.0014	-0.0031	3.2600	-0.0156	-0.1541	0.0004
190.0	-3.3386	-0.5815	0.4448	3.4119	0.2958	-0.4366	0.0298
200.0	-3.8770	-1.1836	1.0755	4.1852	0.5715	-0.8547	0.0898
210.0	-4.2746	-1.9246	1.8864	5.0429	0.9874	-1.3523	0.1600
220.0	-4.2836	-2.7023	2.7376	5.7458	1.4861	-1.8830	0.2239
230.0	-3.9384	-3.4461	3.5571	6.3157	1.9641	-2.3761	0.2900
240.0	-3.2428	-4.0727	4.2599	6.7143	2.4314	-2.8231	0.3354
250.0	-2.3002	-4.5315	4.7765	6.9621	2.8155	-3.1418	0.3202
260.0	-1.1473	-4.6898	4.9305	6.8874	2.9984	-3.2413	0.3360
270.0	-0.0014	-4.6140	5.0848	6.9845	3.1495	-3.3562	0.3257
280.0	1.1508	-4.7169	4.9706	6.9354	3.1653	-3.2593	0.3130
290.0	2.2070	-4.3741	4.5864	6.7013	2.9989	-2.9862	0.2951
300.0	3.1584	-3.9741	4.1484	6.5435	2.8171	-2.6765	0.3001
310.0	3.7851	-3.3256	3.4153	6.0746	2.4587	-2.1740	0.2834
320.0	4.1389	-2.6236	2.6374	5.5531	2.0025	-1.6566	0.2253
330.0	4.1612	-1.8836	1.8328	4.9110	1.4887	-1.0949	0.1479
340.0	3.7952	-1.1650	1.0520	4.0980	0.9390	-0.5557	0.0765
350.0	3.2952	-0.5761	0.4345	3.3683	0.4402	-0.1263	0.0257
360.0	3.2607	-0.0014	-0.0042	3.2607	0.0165	0.1553	-0.0004

TABLE VI - SPACE OPERATIONS CENTER SIXTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.2572	-0.0015	-0.0042	3.2572	0.0167	0.1548	-0.0004
10.0	3.2509	0.4715	-0.5022	3.3179	-0.2059	0.1440	-0.0302
20.0	3.5888	0.8997	-1.1314	3.8623	-0.4434	0.0018	-0.0705
30.0	3.8969	1.4218	-1.8436	4.4787	-0.7265	-0.1963	-0.1298
40.0	3.8472	1.9533	-2.7746	5.1193	-1.0730	1.9021	-0.1735
50.0	3.6037	2.4594	-3.5765	5.5467	-1.4006	2.1750	-0.2248
60.0	2.8839	2.8967	-4.2769	5.7981	-1.7234	2.8158	-0.2525
70.0	2.0003	3.2534	-4.6003	5.8008	-1.9546	3.0413	-0.2888
80.0	0.9807	3.2130	-4.7797	5.8287	-2.0342	3.1184	-0.3062
90.0	0.0020	3.2810	-4.9234	5.9042	-2.1490	3.2189	-0.3040
100.0	-0.9852	3.2834	-4.8782	5.8758	-2.1797	3.1675	-0.2804
110.0	-1.9376	2.9966	-4.5468	5.5063	-2.1058	2.9616	-0.2360
120.0	-2.7652	2.7896	-4.0936	5.0606	-1.9683	2.6674	-0.2135
130.0	-3.3945	2.3935	-3.6640	5.3993	-1.7867	2.2206	-0.2500
140.0	-3.6989	1.8852	-2.6875	4.9275	-1.4950	1.6584	-0.2170
150.0	-3.6484	1.3864	-2.0729	4.4210	-1.1471	1.1171	-0.1503
160.0	-3.5404	0.8906	-1.1090	3.8077	-0.7304	0.5975	-0.0716
170.0	-3.2415	0.4708	-0.4977	3.3079	-0.3961	0.1719	-0.0299
180.0	-3.2614	0.0000	0.0031	3.2614	-0.0155	-0.1541	0.0000
190.0	-3.2558	-0.4720	0.4941	3.3211	0.2111	-0.4630	0.0516
200.0	-3.6230	-0.9037	1.1333	3.8947	0.4008	-0.8668	0.0849
210.0	-3.8525	-1.4093	1.9164	4.5185	0.6761	-1.3751	0.1548
220.0	-3.7623	-1.9148	2.7116	5.0874	1.0043	-1.8634	0.2127
230.0	-3.4012	-2.3998	3.4758	5.2198	1.3061	-2.3114	0.2888
240.0	-2.7923	-2.8159	4.1403	5.7207	1.6469	-2.7455	0.3075
250.0	-1.9453	-3.0817	4.5603	5.8244	1.8967	-2.9974	0.2881
260.0	-0.9854	-3.1268	4.5989	5.6260	1.9841	-3.0376	0.3562
270.0	0.0002	-3.2193	4.7598	5.7318	2.1165	-3.1341	0.4088
280.0	0.9664	-3.1902	4.7296	5.7723	2.1528	-3.0998	0.3011
290.0	1.8643	-2.9768	4.3857	5.6059	2.0570	-2.8627	0.2505
300.0	2.7066	-2.7280	4.0046	5.5379	1.9501	-2.6036	0.2320
310.0	3.3012	-2.3332	3.3693	5.2506	1.7659	-2.1443	0.1635
320.0	3.5970	-1.8094	2.5077	4.7903	1.4963	-1.6004	0.2383
330.0	3.7288	-1.3718	1.8478	4.3648	1.1341	-1.0920	0.1459
340.0	3.4794	-0.8788	1.0886	3.7423	0.7372	-0.5727	0.0751
350.0	3.2201	-0.4685	0.4891	3.2854	0.3624	-0.1646	0.0368
360.0	3.2572	-0.0015	-0.0042	3.2572	0.0167	0.1548	-0.0004

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TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3169	-0.0013	-0.0039	3.3169	0.0032	0.1452	-0.0012
10.0	3.4463	0.4588	-0.5356	3.5109	-0.3137	-0.2488	-0.1685
20.0	3.7457	0.9236	-1.1077	4.0295	-0.5471	-0.7360	0.0092
30.0	4.2410	1.4844	-1.8623	4.6148	-0.8255	-1.5417	0.0436
40.0	4.8852	1.9586	-2.6059	5.1550	-1.1769	-1.9836	0.1233
50.0	5.6340	2.3474	-3.3327	5.7001	-1.4248	-2.0148	0.1450
60.0	2.9858	2.9622	4.4252	6.0948	-2.0079	-3.1972	0.1197
70.0	1.0966	3.1414	4.7160	6.0858	-2.1240	-3.3681	0.1673
80.0	1.0452	3.3424	5.1258	6.2254	-2.3909	-3.7542	0.2362
90.0	0.0071	3.1367	5.2002	6.2258	-2.4360	-3.8070	0.2487
100.0	-1.0332	3.3643	5.0598	6.1512	-2.4485	-3.6964	0.2297
110.0	-2.0372	3.2185	4.8230	5.7338	-2.3858	-3.3584	0.1941
120.0	-2.9259	2.9516	4.3022	5.0031	-2.2464	-2.8692	0.1777
130.0	-3.5550	2.4429	3.6564	4.3655	-1.9755	-2.1012	0.1674
140.0	-3.9802	2.0032	2.8838	5.2981	-1.6098	-2.1594	0.1184
150.0	-3.9562	1.0413	1.9926	4.6493	-1.1978	-1.4719	0.0845
160.0	-3.5756	0.4974	1.1395	3.6509	-0.7867	-0.9024	0.0566
170.0	-3.2516	0.4600	0.5094	3.3193	-0.3821	-0.4048	0.0048
180.0	-3.2634	-0.0009	0.0031	3.2638	-0.0157	-0.1599	-0.0018
190.0	-3.3508	-0.4826	-0.5214	3.4198	0.2493	0.4220	-0.0067
200.0	-3.7018	-0.9511	-1.1948	4.1960	0.5144	0.7615	-0.0258
210.0	-4.0655	-1.4166	-1.9574	4.9566	0.7575	1.0769	-0.0544
220.0	-5.8388	-1.9485	-2.8007	5.1259	1.1102	1.9153	-0.1449
230.0	-5.6048	-2.5188	-3.7185	5.7487	1.3673	2.6021	-0.1721
240.0	-5.9912	-2.9841	-4.4875	6.1583	1.7168	3.1062	-0.1957
250.0	-6.0655	-3.2710	-4.9566	6.2698	2.0498	3.0178	-0.1905
260.0	-5.8967	-3.4783	-5.2736	6.3498	2.4035	3.5961	-0.2252
270.0	-5.5001	-3.5245	-5.3548	6.3781	2.7445	3.9011	-0.2503
280.0	1.0714	-3.4828	-5.2725	6.3976	2.3598	3.8956	-0.2166
290.0	-2.1288	-3.3364	-5.0449	6.4028	2.4742	3.7368	-0.1864
300.0	-2.9557	-2.9851	-4.4852	6.1582	2.0215	3.2105	-0.1554
310.0	-3.0305	-2.5344	-3.7333	5.7866	1.7443	2.9154	-0.1000
320.0	4.0388	-2.0326	-2.9266	5.3759	1.3932	2.1349	-0.1086
330.0	4.0174	-1.4548	-2.0121	4.7187	1.1747	1.8478	-0.0697
340.0	3.8859	-0.9164	-1.1009	3.9864	0.7616	0.9254	-0.0203
350.0	3.5274	-0.4775	-0.5075	3.5345	0.3556	0.4864	-0.0040
360.0	3.3169	-0.0013	-0.0039	3.3189	0.0032	0.1452	-0.0012

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TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3189	-0.0013	-0.0009	3.3189	0.0032	0.1452	-0.0012
10.0	3.5149	0.6018	0.4846	3.5920	-0.4142	-0.2468	0.0170
20.0	4.0888	1.2314	1.1526	[illegible]	-0.7078	-0.7207	0.0055
30.0	4.3302	1.9410	1.9204	[illegible]	-1.1595	-1.2470	0.0568
40.0	4.5109	2.7126	2.7697	5.7868	-1.6828	-1.9321	0.1101
50.0	4.6725	3.5448	3.7463	6.8340	-2.2469	-2.6140	0.1349
60.0	3.4134	4.2479	4.6810	7.0870	-2.8583	-3.1971	0.1501
70.0	2.3126	4.5574	5.0100	7.0868	-3.0624	-3.3505	0.1560
80.0	1.2141	4.9561	5.2853	7.3352	-3.4482	-3.7774	0.1759
90.0	0.0044	5.0669	5.0245	7.4160	-3.5547	-3.8705	0.2408
100.0	1.2215	4.9542	5.2822	7.3324	-3.5321	-3.7707	0.2336
110.0	2.3802	4.6826	4.9796	7.2270	-3.3981	-3.5421	0.2468
120.0	3.3706	4.2103	4.4463	6.9787	-3.1524	-3.2193	0.2223
130.0	4.1040	3.5748	3.7304	6.5902	-2.7845	-2.7451	0.1667
140.0	4.4456	2.7888	2.8578	5.9808	-2.2590	-2.0912	0.1186
150.0	4.3437	1.9868	1.9858	5.1502	-1.6652	-1.4174	0.0838
160.0	3.8719	1.1856	1.0932	4.1655	-0.9671	-0.8577	0.0515
170.0	3.3108	0.5726	0.4574	3.3852	-0.4306	-0.4536	0.0042
180.0	3.2606	0.0005	0.0032	3.2606	-0.0162	-0.1596	0.0018
190.0	3.3623	-0.5865	-0.4624	3.4434	0.3697	0.1836	-0.0062
200.0	4.0257	-1.2159	-1.1311	4.3466	0.6957	0.6665	-0.0167
210.0	4.3560	-1.9247	-1.9214	5.1094	1.0064	1.0659	-0.0766
220.0	4.2781	-2.6942	-2.7615	5.7885	1.4015	1.8501	-0.1377
230.0	4.0180	-3.5097	-3.6687	6.4878	2.1826	2.5345	-0.1864
240.0	3.4178	-4.2561	-4.5229	7.0786	2.7904	3.1579	-0.1911
250.0	2.3916	-4.8908	-5.0061	7.2549	3.2076	3.5040	-0.1697
260.0	1.2416	-5.0406	-5.4172	7.4456	3.5190	3.8475	-0.1865
270.0	0.0012	-5.1767	-5.5745	7.5989	3.6263	4.0252	-0.2291
280.0	1.2556	-5.0845	-5.4573	7.5534	3.6584	3.9421	-0.2225
290.0	2.3484	-4.8838	-5.1292	7.4252	3.4882	3.6924	-0.2080
300.0	3.4133	-4.2591	-4.5118	7.0706	3.1105	3.1791	-0.1965
310.0	4.1635	-3.6132	-3.7614	6.6743	2.7038	2.7160	-0.1416
320.0	4.5209	-2.8308	-2.9047	6.0828	2.1562	2.0865	-0.1034
330.0	4.4864	-2.0830	-1.9908	5.2918	1.5828	1.4714	-0.0658
340.0	3.9561	-1.1965	-1.1012	4.2507	0.9550	0.8565	-0.0257
350.0	3.4042	-0.5887	-0.4565	3.4788	0.4512	0.4445	0.0032
360.0	3.3189	-0.0013	-0.0009	3.3188	0.0032	0.1452	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3188	-0.0014	-0.0008	3.3188	0.0032	0.1452	-0.0012
10.0	3.6263	0.4391	0.4258	3.7128	-0.4852	-0.1863	-0.0195
20.0	4.3397	1.5103	1.0266	4.6993	-0.9706	-0.6105	-0.0149
30.0	4.7010	2.8532	1.7526	5.5140	-1.5400	-1.1549	0.0233
40.0	4.7194	3.4089	2.5556	6.3783	-2.1775	-1.7478	0.0850
50.0	4.6346	4.4442	3.5121	7.1454	-2.9114	-2.5408	0.1451
60.0	3.7426	5.4840	4.1579	7.8239	-3.6563	-2.9091	0.1393
70.0	2.6298	6.0633	4.6083	8.0856	-4.0307	-3.1777	0.1842
80.0	1.5456	5.6348	4.9171	8.2153	-4.4299	-3.4522	0.1869
90.0	0.6625	5.0375	5.1656	8.3408	-4.8103	-3.5763	0.1817
100.0	-1.3611	6.4740	4.9315	8.2419	-4.5330	-3.4444	0.2300
110.0	-2.6483	6.1187	4.8586	8.1228	-4.1828	-3.2349	0.2541
120.0	-3.7562	5.4956	4.1628	7.0411	-4.0299	-2.9371	0.2159
130.0	-4.5418	4.6251	3.4783	7.5457	-3.4864	-2.5081	0.1448
140.0	-4.9026	3.5834	2.6488	6.6144	-2.7283	-1.9425	0.0950
150.0	-4.6558	2.4812	1.7402	5.5263	-1.8721	-1.2865	0.0551
160.0	-4.2026	1.4751	0.9955	4.5545	-1.1245	-0.7969	0.0084
170.0	-3.4193	0.6731	0.4950	3.5010	-0.4974	-0.4199	-0.0089
180.0	-3.2719	-0.0010	0.0030	3.2719	-0.0146	-0.1604	-0.0020
190.0	-3.4626	-0.6863	-0.3975	3.5457	0.3796	0.1584	0.0043
200.0	-4.2808	-1.4383	-1.0009	4.6211	0.9754	0.5046	-0.0066
210.0	-4.6501	-2.4264	-1.7212	5.6477	1.4897	1.0905	-0.0464
220.0	-4.6750	-3.4367	-2.5213	6.3152	2.0652	1.6771	-0.1205
230.0	-4.3234	-4.4320	-3.3197	7.0183	2.7647	2.2620	-0.1728
240.0	-3.6949	-5.4069	-4.1053	7.7196	3.3202	2.8240	-0.1826
250.0	-2.8172	-6.0445	-4.6460	8.0915	4.1103	3.2751	-0.1974
260.0	-1.8531	-6.4359	-4.9741	8.2771	4.4802	3.5206	-0.2264
270.0	-0.8665	-6.6033	-5.1416	8.4245	4.8031	3.8017	-0.2420
280.0	1.3917	-6.5900	-5.0595	8.4157	4.6754	3.5991	-0.2221
290.0	2.4939	-6.1904	-4.7404	8.2407	4.4503	3.3583	-0.2455
300.0	3.4579	-5.6979	-4.1714	7.6485	3.9829	2.9011	-0.2105
310.0	4.3349	-4.8252	-3.4754	7.3423	3.3423	2.4314	-0.1508
320.0	4.8849	-3.5748	-2.6427	6.5940	2.6851	1.8947	-0.0932
330.0	4.7434	-2.4739	-1.7645	5.8225	1.8846	1.3037	-0.0452
340.0	4.2604	-1.4041	-0.9955	4.5919	1.1441	0.7415	-0.0114
350.0	3.5876	-0.6172	-0.4014	3.6312	0.3161	0.4003	0.0000
360.0	3.3188	-0.0014	-0.0008	3.3188	0.0032	0.1452	-0.0012

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TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 496 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3152	-0.0015	-0.0008	3.3152	0.0034	0.1447	-0.0011
10.0	3.7108	0.7965	0.4014	3.8048	-0.5872	-0.1096	-0.0023
20.0	4.5434	1.7522	0.8813	4.9328	-1.1201	-0.4790	-0.0198
30.0	4.9939	2.8872	1.4810	5.9650	-1.8284	-0.9368	-0.0002
40.0	5.0447	4.1359	2.1254	6.0496	-2.0639	-1.4234	0.0326
50.0	4.6392	5.3403	2.7817	7.0060	-3.4530	-1.8041	0.0908
60.0	3.9379	6.4770	3.4182	8.3833	-4.3983	-2.3586	0.1000
70.0	2.8876	7.3395	3.8852	8.7722	-4.8361	-2.6959	0.1283
80.0	1.8370	7.7114	4.0768	8.8356	-5.2401	-2.8590	0.1629
90.0	0.8004	7.5164	4.1976	8.4554	-5.4559	-2.9245	0.1547
100.0	-1.4649	7.8015	4.1368	8.9848	-5.4865	-2.8562	0.2125
110.0	-2.8397	7.3447	4.0913	8.7766	-5.1827	-2.6975	0.2246
120.0	-4.0224	6.5877	3.4755	8.4568	-4.7478	-2.4374	0.1754
130.0	-4.8175	5.4913	2.6760	7.8415	-4.0245	-2.0021	0.1078
140.0	-5.1064	4.1820	2.1519	6.9312	-3.0991	-1.5755	0.0564
150.0	-4.8228	2.8695	1.4358	5.8607	-2.1868	-1.0435	0.0268
160.0	-4.3630	1.6978	0.8088	4.7410	-1.2710	-0.6071	-0.0006
170.0	-3.4636	0.7537	0.3130	3.5515	-0.5492	-0.3544	-0.0120
180.0	-3.2705	-0.0007	0.0030	3.2705	-0.0154	-0.1609	-0.0020
190.0	-3.5070	-0.7656	-0.3139	3.5881	-0.4417	0.0829	0.0062
200.0	-4.4771	-1.7280	-0.8191	4.8589	1.0280	0.4550	0.0059
210.0	-4.9367	-2.8627	-1.4310	5.6691	1.7061	0.8552	-0.0150
220.0	-5.0235	-4.1113	-2.1082	6.8143	2.5563	1.3842	-0.0655
230.0	-4.6173	-5.2828	-2.7507	7.5258	3.5125	1.8826	-0.1249
240.0	-3.9233	-6.4297	-3.3956	8.2543	4.1796	2.3105	-0.1361
250.0	-2.8524	-7.2971	-3.8795	8.7297	4.8665	2.6717	-0.1512
260.0	-1.4475	-7.7106	-4.1100	8.8510	5.2483	2.8776	-0.1967
270.0	0.0026	-7.7661	-4.2616	9.0601	5.3064	2.9090	-0.1602
280.0	1.4825	-7.8557	-4.1968	9.0236	5.4912	2.9343	-0.2154
290.0	2.8410	-7.3248	-3.8940	8.7623	5.1467	2.6747	-0.2413
300.0	4.0202	-6.5740	-3.4739	8.4447	4.6957	2.4047	-0.1758
310.0	4.8526	-5.5036	-2.8431	7.4624	4.0050	2.0516	-0.1155
320.0	5.1327	-4.1981	-2.1625	6.9637	3.0921	1.5538	-0.0611
330.0	5.0081	-2.9081	-1.4509	5.9573	2.1760	1.0807	-0.0263
340.0	4.4555	-1.7245	-0.8116	4.8363	1.3064	0.6556	0.0002
350.0	3.6215	-0.7812	-0.3194	3.7114	0.5711	0.3462	0.0104
360.0	3.3152	-0.0015	-0.0008	3.3152	0.0034	0.1447	-0.0011

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TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3180	-0.0015	-0.0008	3.3180	0.0053	0.1451	-0.0012
10.0	3.7662	0.8616	0.2812	3.8577	-0.3606	-0.0176	-0.0281
20.0	4.6079	1.9122	0.5856	5.0138	-1.2437	-0.2916	-0.0340
30.0	5.2188	3.2527	1.0433	6.2268	-2.6495	-0.6312	-0.0274
40.0	5.2481	4.8359	1.5196	7.1551	-3.9668	-0.9887	-0.0050
50.0	4.6764	6.6175	1.9946	7.9882	-4.9186	-1.2658	0.0262
60.0	4.0629	7.2217	2.4100	8.6222	-4.7408	-1.6425	0.0701
70.0	2.0387	8.2006	2.7550	9.1328	-5.0598	-1.8040	0.0907
80.0	1.5153	8.6864	2.9162	9.2838	-5.0391	-2.0067	0.1219
90.0	0.0006	8.8460	2.9615	9.3500	-5.0360	-2.0553	0.1476
100.0	-1.5278	8.7398	2.9411	9.3437	-5.9860	-2.0108	0.1525
110.0	-2.9398	8.2088	2.7581	9.1403	-5.7330	-1.8867	0.1359
120.0	-4.1586	7.3270	2.4598	8.7610	-5.1929	-1.7116	0.1119
130.0	-4.9255	6.0668	2.0141	8.0041	-4.3668	-1.4415	0.0647
140.0	-5.2591	4.6429	1.5234	7.1679	-3.5838	-1.1322	0.0226
150.0	-5.1401	3.2145	1.0305	6.1380	-2.5451	-0.8227	-0.0114
160.0	-4.8274	1.8553	0.5634	4.8219	-1.5414	-0.5111	-0.0207
170.0	-3.5320	0.6150	0.2035	3.6258	-0.5895	-0.2462	-0.0167
180.0	-3.2721	-0.0004	0.0031	3.2721	-0.0154	-0.1602	-0.0019
190.0	-3.6176	-0.8374	-0.2288	3.7126	0.4439	0.0184	0.0028
200.0	-4.5505	-1.6851	-0.5685	4.9290	1.1150	0.2699	0.0172
210.0	-5.1447	-2.1434	-0.6982	5.6886	1.4516	0.3770	0.0270
220.0	-5.2365	-4.6130	-1.5054	7.1286	2.8936	0.9496	-0.0176
230.0	-4.8113	-5.0215	-1.9588	7.8755	3.7491	1.2788	-0.0605
240.0	-4.0550	-7.1486	-2.5913	8.5416	4.6084	1.6081	-0.1035
250.0	-2.9341	-8.1436	-2.7490	8.9857	5.5878	1.8725	-0.1182
260.0	-1.5265	-8.0950	-2.6596	8.8997	5.5591	2.0287	-0.1523
270.0	0.0032	-8.9277	-3.0206	9.4231	6.0854	2.0944	-0.1525
280.0	1.5428	-8.7954	-2.9848	9.4124	6.0626	2.0619	-0.1561
290.0	2.9534	-8.2088	-2.7656	8.9478	5.7190	1.8864	-0.1278
300.0	4.1400	-7.3213	-2.4592	8.1576	5.1760	1.6911	-0.1158
310.0	5.0528	-6.0856	-2.0252	6.9978	4.3552	1.4252	-0.0867
320.0	5.3278	-4.6868	-1.5338	7.2493	3.5911	1.1133	-0.0243
330.0	5.1520	-3.2105	-1.0164	6.1839	2.5605	0.7719	0.0009
340.0	4.5535	-1.7861	-0.5627	4.9329	1.5965	0.4826	0.0153
350.0	3.6526	-0.6855	-0.2240	3.7480	0.6550	0.2047	0.0154
360.0	3.3180	-0.0015	-0.0008	3.3180	0.0053	0.1451	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3165	-0.0015	-0.0007	3.3165	0.0033	0.1450	-0.0012
10.0	3.2817	1.0478	0.1293	3.0668	-0.3727	0.0816	-0.0224
20.0	4.6564	2.0142	0.3065	5.0728	-0.8779	-0.0935	-0.0377
30.0	5.2548	3.0211	0.5419	6.3818	-2.1388	-0.2776	-0.0451
40.0	5.3783	4.0492	0.7982	7.5416	-3.1932	-0.4764	-0.0573
50.0	4.8659	5.0980	1.0411	8.1574	-4.1143	-0.6852	-0.0235
60.0	4.1570	7.7065	1.2618	8.8852	-5.0380	-0.8433	0.0165
70.0	2.9733	8.6885	1.4315	9.0005	-5.7346	-0.9710	0.0004
80.0	1.5472	9.2035	1.5245	9.5133	-6.1675	-1.0412	0.0079
90.0	-0.0005	9.4358	1.5327	9.5619	-6.3407	-1.0627	0.0166
100.0	-1.5513	9.2792	1.5276	9.5298	-6.3694	-1.0422	0.0906
110.0	-2.8796	8.8132	1.4366	8.8188	-6.0198	-0.9446	0.0833
120.0	-4.1557	7.7164	1.2623	8.0391	-5.3824	-0.8068	0.0427
130.0	-4.9600	6.4048	1.0415	6.1628	-4.3115	-0.7164	-0.0638
140.0	-5.2955	4.8928	0.7891	7.2418	-3.4545	-0.6260	-0.0261
150.0	-5.1249	3.3591	0.5295	6.1388	-2.5773	-0.4721	-0.0358
160.0	-4.4718	1.9486	0.2945	4.8759	-1.5909	-0.3225	-0.0292
170.0	-3.3769	0.8603	0.1179	3.0752	-0.8261	-0.2268	-0.0193
180.0	-3.2703	-0.0004	0.0032	3.2703	-0.0198	-0.1602	-0.0019
190.0	-3.6782	-0.6408	-0.1212	3.7366	0.8719	-0.0536	0.0138
200.0	-4.5024	-1.9584	-0.2924	4.9065	1.0919	0.0703	0.0244
210.0	-5.1695	-3.3718	-0.5251	6.1422	2.0553	0.2496	0.0321
220.0	-5.3460	-4.9147	-0.7829	7.2937	3.0779	0.4543	0.0176
230.0	-4.9388	-6.3559	-1.0237	8.1052	4.0471	0.6383	0.0037
240.0	-4.1435	-7.6029	-1.2517	8.7952	4.9628	0.8249	-0.0201
250.0	-2.9766	-8.6005	-1.4241	9.2707	5.8089	0.9585	-0.0421
260.0	-1.5530	-9.2643	-1.5293	9.5165	6.1466	1.0415	-0.0896
270.0	0.0069	-9.4744	-1.5704	9.4631	6.0840	1.0734	-0.1044
280.0	1.5638	-9.3127	-1.5437	9.3672	6.3357	1.0523	-0.0921
290.0	2.9925	-8.6987	-1.4343	9.3078	6.0116	0.9840	-0.0758
300.0	4.1731	-7.7040	-1.2627	8.8510	5.5474	0.8778	-0.0457
310.0	4.9150	-6.4184	-1.0353	8.1600	4.5417	0.7476	-0.0065
320.0	5.3501	-4.9210	-0.7852	7.3009	3.5054	0.6000	0.0183
330.0	5.1570	-3.3635	-0.5172	6.1671	2.4258	0.4361	0.0274
340.0	4.3521	-1.9760	-0.2928	4.9804	1.4497	0.3064	0.0261
350.0	3.0509	-0.8790	-0.1146	3.7553	0.6652	0.2178	0.0115
360.0	3.3165	-0.0015	-0.0007	3.3165	0.0033	0.1450	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3160	-0.0015	-0.0006	3.3160	0.0033	0.1449	-0.0012
10.0	3.7553	0.9040	0.0040	3.6538	-0.3747	0.1564	-0.0244
20.0	4.6320	2.0361	0.0019	5.0498	-1.2300	0.1209	-0.0428
30.0	5.2101	3.4468	0.0035	6.2354	-2.1501	0.0968	-0.0576
40.0	5.3310	4.9756	0.0045	7.2844	-3.1824	0.0721	-0.0659
50.0	4.9422	6.4604	0.0002	8.1252	-4.1542	0.0531	-0.0623
60.0	4.1328	7.7766	-0.0012	8.8011	-5.0636	0.0268	-0.0435
70.0	2.9766	8.8118	-0.0029	9.2958	-5.8023	0.0124	-0.0249
80.0	1.5506	9.4032	-0.0040	9.5293	-6.2297	0.0046	-0.0033
90.0	0.0010	9.6736	-0.0034	9.6736	-6.4751	0.0006	0.0151
100.0	-1.5459	9.5818	-0.0020	9.5072	-6.5500	-0.0071	-0.0003
110.0	-2.9623	9.2928	-0.0008	9.2756	-6.5749	-0.0201	-0.0175
120.0	-4.1423	7.8038	0.0024	8.8293	-5.4344	-0.0418	-0.0398
130.0	-4.9460	6.4815	0.0003	8.1442	-4.5281	-0.0639	-0.0552
140.0	-5.2499	4.8353	0.0026	7.1939	-3.4301	-0.0924	-0.0597
150.0	-5.1186	3.4855	0.0043	6.1383	-2.3887	-0.1128	-0.0514
160.0	-4.5285	1.9939	0.0012	4.9373	-1.4104	-0.1289	-0.0405
170.0	-3.6391	0.8615	0.0007	3.7368	-0.6236	-0.1401	-0.0237
180.0	-3.2680	-0.0004	0.0033	3.2680	-0.0155	-0.1602	-0.0019
190.0	-3.2490	-0.9041	0.0025	3.8490	0.5453	-0.1475	0.0185
200.0	-4.5566	-2.0061	0.0028	4.9679	1.1746	-0.1471	0.0408
210.0	-5.2221	-3.4532	0.0016	6.2491	2.1344	-0.1450	0.0550
220.0	-5.3593	-5.0003	0.0010	7.3195	3.1719	-0.0914	0.0571
230.0	-4.9358	-6.4528	-0.0003	8.1158	4.1119	-0.0647	0.0524
240.0	-4.1492	-7.7886	0.0000	8.8191	5.0561	-0.0386	0.0385
250.0	-2.9790	-8.7896	-0.0011	9.2784	5.7545	-0.0190	0.0220
260.0	-1.5556	-9.3665	-0.0034	9.4942	6.1858	-0.0035	-0.0037
270.0	-0.0014	-9.6792	-0.0050	9.6792	6.4765	0.0020	-0.0261
280.0	1.5518	-9.3621	-0.0043	9.4892	6.3627	0.0044	-0.0027
290.0	2.9639	-8.7513	-0.0030	9.2372	6.0728	0.0107	0.0165
300.0	4.1453	-7.7747	-0.0005	8.8057	5.4606	0.0254	0.0348
310.0	4.9758	-6.4976	-0.0015	8.1757	4.3931	0.0504	0.0510
320.0	5.3057	-4.9648	-0.0047	7.2556	3.5067	0.0834	0.0577
330.0	5.1691	-3.4210	-0.0043	6.1868	2.4332	0.1053	0.0520
340.0	4.5668	-2.0120	-0.0059	4.9814	1.4547	0.1229	0.0361
350.0	3.6926	-0.8978	-0.0033	3.7923	0.6356	0.1436	0.0215
360.0	3.3160	-0.0015	-0.0006	3.3160	0.0033	0.1449	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3160	-0.0015	-0.0006	3.3160	0.0033	0.1449	-0.0012
10.0	3.6294	0.8762	-0.1167	3.7273	-0.8720	0.2203	-0.0276
20.0	4.5189	1.8061	-0.2000	4.5268	-1.1271	0.3201	-0.0540
30.0	5.1822	3.0010	-0.2881	5.1988	-2.8690	0.4613	-0.0766
40.0	5.3406	4.9206	-0.7902	7.2940	-3.0861	0.6269	-0.1019
50.0	4.9881	6.4281	-1.0460	8.1946	-4.1162	0.7748	-0.1112
60.0	4.1948	7.7709	-1.2756	8.9106	-5.0291	0.8999	-0.1099
70.0	2.9999	8.7447	-1.4488	9.3695	-5.7393	0.9991	-0.1018
80.0	1.5573	9.3158	-1.5409	9.5666	-6.1693	1.0490	-0.0828
90.0	0.0038	9.3693	-1.5473	9.4958	-6.2607	1.0483	-0.0601
100.0	-1.5452	8.8825	-1.4877	9.4818	-6.2626	1.0241	-0.0775
110.0	-2.8608	8.0468	-1.3833	9.2663	-5.9878	0.9848	-0.0962
120.0	-4.1490	7.6940	-1.2504	8.8244	-5.5529	0.8125	-0.1068
130.0	-4.9855	6.3773	-1.0310	8.1270	-4.9621	0.6548	-0.1006
140.0	-5.2698	4.8697	-0.7797	7.2058	-3.4173	0.4356	-0.0938
150.0	-5.0772	3.3367	-0.5345	6.0817	-2.5828	0.2397	-0.0674
160.0	-4.4614	1.9412	-0.2818	4.8629	-1.5871	0.0674	-0.0462
170.0	-3.5593	0.8558	-0.1119	3.6549	-0.8207	-0.0700	-0.0271
180.0	-3.2640	-0.0004	0.0035	3.2640	-0.0171	-0.1604	-0.0019
190.0	-3.2035	-0.8852	0.1268	3.8824	0.5866	-0.2393	0.0232
200.0	-4.5778	-1.9856	0.3051	4.9886	1.1860	-0.3641	0.0507
210.0	-5.2021	-3.3878	0.5359	6.2194	2.1082	-0.5055	0.0766
220.0	-5.3940	-4.9537	0.7998	7.3569	3.1238	-0.6455	0.0909
230.0	-5.0172	-6.2391	1.0865	8.2217	4.1537	-0.7980	0.1089
240.0	-4.1764	-7.7119	1.2629	8.6562	5.0055	-0.9068	0.1094
250.0	-3.0094	-8.7350	1.4400	9.3476	5.7350	-1.0070	0.1048
260.0	-1.5581	-9.2557	1.5218	9.5072	6.1069	-1.0394	0.0966
270.0	-0.0027	-9.3486	1.5304	9.4722	6.2303	-1.0355	0.0841
280.0	1.5471	-9.2132	1.5107	9.4622	6.2602	-1.0240	0.0983
290.0	2.9651	-8.6298	1.4185	9.2312	5.9628	-0.9538	0.1043
300.0	4.1277	-7.6376	1.2481	8.7652	5.3536	-0.8252	0.1044
310.0	4.9842	-6.4008	1.0360	8.1702	4.5294	-0.6481	0.1060
320.0	5.3749	-4.9391	0.7924	7.3322	3.5387	-0.4631	0.0900
330.0	5.2285	-3.4033	0.5321	6.2494	2.4748	-0.2678	0.0673
340.0	4.5459	-1.9926	0.2966	5.0055	1.4606	-0.0820	0.0455
350.0	3.7224	-0.8914	0.1215	3.8220	0.6546	0.0555	0.0251
360.0	3.3160	-0.0015	-0.0006	3.3166	0.0033	0.1449	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
10.0	3.6514	[illegible]	[illegible]	3.7466	[illegible]	0.2882	-0.0278
50.0	5.2156	5.2533	-1.0336	6.2221	-2.0568	0.8224	-0.0904
50.0	4.9315	6.0789	[illegible]	8.0742	-3.8722	1.4337	-0.1598
70.0	2.9496	6.2135	-2.7545	9.1466	-5.5298	1.8613	-0.1707
90.0	0.8090	6.6847	-2.9221	9.1696	-5.8150	1.9683	-0.1862
110.0	-2.8856	8.0493	-2.7066	8.9498	-5.5810	1.8126	-0.1696
130.0	-4.8183	5.9481	[illegible]	7.8918	-4.2113	1.2722	-0.1394
150.0	-5.0496	3.1863	-1.0110	6.0776	-2.3057	0.5041	-0.0864
170.0	-3.5492	0.0200	[illegible]	3.6419	-0.6040	0.0087	-0.0269
190.0	-3.6676	-0.8451	0.2352	3.7436	0.4898	-0.3064	0.0255
210.0	-5.1758	-3.2226	1.0347	6.1734	2.8069	-0.8448	0.0940
230.0	-4.9466	-6.1792	2.0216	[illegible]	5.2915	[illegible]	0.1650
250.0	-2.9563	-8.2069	2.7573	9.1436	5.3843	-1.9069	0.1916
270.0	-0.0032	-8.6991	2.9191	9.1729	5.8611	-1.9905	0.1816
290.0	2.8961	-8.0696	2.7072	8.9866	5.0539	-1.8487	0.1916
310.0	4.8605	-5.9878	1.9869	7.9550	4.5243	-1.3258	0.1473
330.0	5.2722	-3.6421	1.6202	7.1768	3.5063	[illegible]	[illegible]
350.0	3.6916	-0.8521	0.2298	3.7881	0.6201	-0.0167	0.0237

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	5.3109	-0.0013	-0.0009	5.3109	0.0032	0.1452	-0.0012
10.0	5.5835	[illegible]	[illegible]	[illegible]	[illegible]	0.3519	-0.0279
20.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.6893	-0.0650
30.0	5.0269	2.9165	-1.4543	5.9747	-1.0145	1.1048	-0.1045
40.0	5.0955	[illegible]	[illegible]	[illegible]	[illegible]	1.5108	-0.1529
50.0	4.7645	5.0370	-2.8373	7.7581	-3.0265	1.9886	-0.1979
60.0	3.9866	[illegible]	[illegible]	[illegible]	[illegible]	2.3531	-0.2157
70.0	2.8494	7.3209	-5.0745	8.7492	-4.7501	2.6284	-0.2216
80.0	1.8555	[illegible]	[illegible]	[illegible]	[illegible]	2.7948	-0.2112
90.0	0.8673	7.7928	-6.1403	8.8188	-5.2862	2.8378	-0.2120
100.0	-1.8321	[illegible]	[illegible]	[illegible]	[illegible]	2.7733	-0.2203
110.0	-2.7957	7.2180	-5.0136	8.0186	-5.0501	2.5012	-0.2551
120.0	-3.9135	[illegible]	[illegible]	[illegible]	[illegible]	2.2066	-0.2135
130.0	-4.6403	5.3072	[illegible]	[illegible]	-3.0227	1.8276	-0.1864
140.0	-4.9998	[illegible]	[illegible]	[illegible]	[illegible]	1.3739	-0.1355
150.0	-4.9261	2.8595	-1.4180	5.2586	-2.1330	0.8944	-0.0967
160.0	-4.3129	1.6790	[illegible]	[illegible]	[illegible]	0.3901	-0.0715
170.0	-3.4810	0.7546	[illegible]	3.8684	-0.5523	0.0686	-0.0267
180.0	-3.2438	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
190.0	-3.6112	-0.7791	0.3287	3.7020	0.4784	-0.5815	0.0227
200.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
210.0	-4.9733	[illegible]	[illegible]	5.9186	1.7581	-1.1292	0.1151
220.0	-5.1388	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
230.0	-4.7747	-5.4433	2.8479	7.7710	3.4629	-2.0451	0.2119
240.0	-3.9772	-6.5051	3.4273	8.3514	4.2952	-2.4040	0.2414
250.0	-2.8340	-7.3012	3.8695	8.7284	4.8243	-2.6961	0.2556
260.0	-1.4586	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
270.0	-0.0003	-7.7520	4.1055	8.7661	5.2762	-2.8272	0.2525
280.0	1.4204	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
290.0	2.7194	-7.1715	3.7913	[illegible]	[illegible]	[illegible]	[illegible]
300.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
310.0	4.6999	-5.3643	[illegible]	7.6547	5.9493	-1.9157	0.1906
320.0	5.0278	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
330.0	4.9754	-2.8672	1.4482	5.9213	2.1920	-0.7547	0.0758
340.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
350.0	3.6385	-0.7858	0.3311	3.7301	0.5619	-0.0904	0.0215
360.0	3.3188	-0.0012	-0.0008	3.3188	0.0032	0.1452	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0.,0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3189	-0.0013	-0.0009	3.3189	0.0032	0.1452	-0.0012
10.0	3.5080	0.6928	-0.3986	3.5913	-0.3911	0.4076	-0.0282
20.0	4.2284	1.4823	-0.8538	4.5404	-0.8437	0.7988	-0.0485
30.0	4.6918	2.4505	-1.7392	5.5607	-1.4563	1.2032	-0.1160
40.0	4.8412	3.5419	-2.6056	6.5288	-2.1562	1.6537	-0.1746
50.0	4.4593	4.5495	-3.4045	7.2123	-2.8250	2.3571	-0.2169
60.0	3.2357	5.4584	-4.1373	7.7882	-3.4786	2.8306	-0.2413
70.0	2.6873	6.1741	-4.7161	8.2119	-4.0906	3.2793	-0.2346
80.0	1.6570	6.4462	-4.9202	8.2131	-4.3409	3.4107	-0.2341
90.0	0.0055	6.5195	-4.9448	8.1982	-4.4659	3.4536	-0.2513
100.0	-1.3472	6.4278	-4.8128	8.1985	-4.4782	3.4074	-0.2505
110.0	-2.6444	6.0808	-4.6376	8.0828	-4.3202	3.2098	-0.2659
120.0	-3.6435	5.3457	-4.0434	7.6142	-3.8382	2.7424	-0.2154
130.0	-4.3511	4.4500	-3.3177	7.0417	-3.3153	2.2570	-0.2399
140.0	-4.7558	3.4827	-2.5576	6.4104	-2.6358	1.7083	-0.1712
150.0	-4.8228	2.4166	-1.7069	5.4775	-1.8420	1.0869	-0.1135
160.0	-4.6852	1.4342	-0.9599	4.8265	-1.1102	0.5085	-0.0750
170.0	-3.3856	0.6655	-0.3876	3.4689	-0.5076	0.1179	-0.0282
180.0	-3.2606	-0.0005	0.0032	3.2606	-0.0162	-0.1596	-0.0018
190.0	-3.4762	-0.6852	0.4040	3.5596	0.3890	-0.4212	0.0253
200.0	-4.2122	-1.4768	0.9948	4.5630	0.8402	-0.8141	0.0647
210.0	-4.6699	-2.4800	1.7436	5.5392	1.4318	-1.3201	0.1306
220.0	-4.8213	-3.5365	2.6098	6.5077	2.1543	-1.9083	0.1884
230.0	-4.4552	-4.5419	3.4067	7.2064	2.8566	-2.4575	0.2453
240.0	-3.7103	-5.4281	4.1106	7.7445	3.5126	-2.9069	0.2865
250.0	-2.6335	-6.0691	4.6227	8.0617	3.9696	-3.2022	0.3098
260.0	-1.3409	-6.3667	4.8476	8.1083	4.2565	-3.3418	0.3095
270.0	0.0012	-6.4999	4.9606	8.1678	4.4774	-3.4630	0.3000
280.0	1.3334	-6.3578	4.8365	8.0883	4.4351	-3.4433	0.3067
290.0	2.5667	-5.9513	4.4975	7.8659	4.2159	-3.3095	0.3065
300.0	3.6937	-5.4020	4.0948	7.7097	3.9814	-3.0553	0.2858
310.0	4.4026	-4.4919	3.3653	7.1228	3.3969	-2.3378	0.2383
320.0	4.7858	-3.5851	2.5877	6.4611	2.6842	-1.7638	0.1690
330.0	4.6484	-2.4323	1.7311	5.5135	1.8815	-1.1186	0.1174
340.0	4.2479	-1.4866	0.9985	4.6006	1.1365	-0.5656	0.0634
350.0	3.5368	-0.6958	0.4084	3.6212	0.5059	-0.1391	0.0212
360.0	3.3189	-0.0013	-0.0009	3.3189	0.0032	0.1452	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 50°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3168	-0.0014	-0.0008	3.3168	0.0032	-0.1452	-0.0012
10.0	3.2916	[illegible]	[illegible]	3.5072	-0.3653	0.4517	-0.0247
20.0	4.0088	[illegible]	[illegible]	4.2287	-0.6760	0.8808	-0.0704
30.0	4.4453	1.9836	-1.9637	5.2306	-1.1439	1.4552	-0.1250
40.0	4.4766	2.8050	-2.8742	6.0034	-1.6994	2.0702	-0.1758
50.0	4.1415	3.4883	-3.7598	6.6413	-2.2513	2.6623	-0.2231
60.0	3.6277	[illegible]	[illegible]	7.0886	-2.7385	3.1528	-0.2528
70.0	2.9748	4.8547	-5.1729	7.4902	-3.2696	3.6073	-0.2746
80.0	1.2451	5.0465	-5.3447	7.8341	-3.8692	3.8029	-0.2210
90.0	0.0042	[illegible]	[illegible]	7.5184	-3.6034	3.9389	-0.2570
100.0	-1.2419	[illegible]	[illegible]	7.5184	-3.6003	3.6754	-0.2211
110.0	-2.3831	4.6797	-4.9756	7.2228	-3.3957	3.5635	-0.2065
120.0	-3.3576	[illegible]	[illegible]	6.4573	-3.1069	3.1137	-0.2041
130.0	-3.0925	[illegible]	[illegible]	6.4147	-2.6968	2.5443	-0.2581
140.0	-4.3954	[illegible]	[illegible]	5.8961	-2.1483	1.9240	-0.1814
150.0	-4.4113	1.9690	-1.9484	5.1994	-1.5665	1.2947	-0.1215
160.0	-3.8482	1.1039	-1.0961	4.2040	-0.9516	0.6271	-0.0746
170.0	-3.2852	[illegible]	[illegible]	3.3588	-0.4438	0.1612	-0.0271
180.0	-3.3718	[illegible]	[illegible]	3.2719	-0.0146	-0.1604	-0.0020
190.0	-3.3709	-0.5828	0.4625	3.4463	0.3177	-0.4506	0.0253
200.0	-3.9415	-1.1973	1.1104	4.2579	0.8103	-0.8426	0.0803
210.0	-4.4874	-1.8715	1.9643	5.2029	1.1094	-1.4930	0.1420
220.0	-4.4691	-2.8078	2.8759	5.8858	1.7135	-2.1380	0.1914
230.0	-4.1228	-3.5611	3.7435	6.6101	2.2526	-2.7116	0.2512
240.0	-3.4069	-4.2851	4.4933	7.0474	2.7765	-3.2345	0.2952
250.0	-2.4116	-4.7200	5.0280	7.2951	3.1509	-3.5674	0.3069
260.0	-1.1949	-4.8600	5.1277	7.1751	3.2044	-3.6160	0.3196
270.0	0.0035	-5.0271	5.3659	7.3418	3.5038	-3.7998	0.2952
280.0	1.1984	-4.8899	5.1970	7.2206	3.4525	-3.6453	0.2918
290.0	2.2955	-4.5327	4.7885	6.9699	3.2433	-3.3186	0.2777
300.0	3.3466	-4.1736	4.4114	6.6231	2.9341	-2.9301	0.2692
310.0	4.0092	-3.4893	3.6346	6.4279	2.7102	-2.5699	0.2471
320.0	4.3884	-2.7927	2.8172	6.0462	2.1891	-1.9541	0.1941
330.0	4.3967	-1.9671	1.9451	5.1648	1.5941	-1.5053	0.1255
340.0	3.9477	-1.2112	1.1825	4.3164	0.9886	-0.8644	0.0645
350.0	3.4241	-0.5909	0.4870	3.5001	0.4288	-0.1773	0.0167
360.0	3.3168	-0.0014	-0.0008	3.3168	0.0032	-0.1452	-0.0012

TABLE VII - SPACE OPERATIONS CENTER SEVENTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.3152	-0.0015	-0.0608	3.3152	0.0034	0.1447	-0.0011
10.0	3.3786	[illegible]	[illegible]	[illegible]	[illegible]	0.5906	-0.0272
20.0	3.6791	[illegible]	[illegible]	[illegible]	[illegible]	0.9158	-0.0670
30.0	4.0024	1.4523	-1.9969	4.6939	-0.6026	1.4658	-0.1191
40.0	3.9865	2.0113	-2.8876	5.3092	-1.1881	2.0516	-0.1629
50.0	3.6770	[illegible]	[illegible]	5.0477	-1.5059	2.7008	-0.2050
60.0	[illegible]	[illegible]	[illegible]	[illegible]	-1.9681	3.2529	-0.2257
70.0	2.1393	3.3495	-5.0625	6.4252	-2.3011	3.6609	-0.1622
80.0	1.0546	3.4227	-5.1482	6.2898	-2.4092	3.8157	-0.2575
90.0	0.0021	3.4082	-5.3337	6.3698	-2.5139	3.9254	-0.3294
100.0	-1.0575	[illegible]	[illegible]	[illegible]	-2.5823	3.8883	-0.2806
110.0	-2.0778	3.2674	-4.9165	6.2467	-2.4259	3.6099	-0.1697
120.0	-2.9381	2.4373	-4.3855	6.0283	-2.2653	3.1696	-0.1822
130.0	-3.5712	[illegible]	[illegible]	[illegible]	-1.9517	2.5942	-0.2253
140.0	-3.8848	[illegible]	[illegible]	[illegible]	-1.5881	1.8878	-0.2049
150.0	-3.9632	1.4383	-1.9828	4.6504	-1.2079	1.3504	-0.1290
160.0	-3.6294	0.9009	-1.1443	3.6988	-0.7408	0.8780	-0.0660
170.0	-3.2097	[illegible]	[illegible]	[illegible]	-0.3840	0.1897	-0.0298
180.0	-3.2705	[illegible]	[illegible]	[illegible]	-0.8158	-0.1605	+0.0020
190.0	-3.3049	-0.4757	0.5159	3.3775	0.2465	-0.4971	0.0242
200.0	-3.6656	-0.9109	1.1647	3.9453	0.4305	-0.9194	0.0770
210.0	-4.0158	-1.2458	2.0195	4.7159	0.8078	-1.5653	0.1304
220.0	-3.9803	-2.0[illegible]	2.[illegible]	[illegible]	1.2166	-2.1885	0.1778
230.0	-3.6212	-2.5256	3.7207	5.7653	1.5729	-2.7482	0.2432
240.0	-2.9833	-2.9731	4.4424	6.1108	1.9553	-3.2760	0.2630
250.0	-2.0666	-3.2426	4.8676	6.1913	2.1773	-3.5134	0.2566
260.0	-0.9374	-3.2759	4.8831	5.9508	2.2329	-3.5046	0.3393
270.0	0.0071	-3.4067	5.1144	6.1325	2.4292	-3.7299	0.3743
280.0	1.0178	-3.3427	5.0178	6.1021	2.4087	-3.5911	0.2778
290.0	1.9663	-3.1136	4.6456	5.9154	2.2782	-3.2952	0.2543
300.0	2.9250	-2.9062	4.3435	5.9785	2.2289	-3.1954	0.1861
310.0	3.5646	-2.4882	3.6553	5.6669	1.9877	-2.6518	0.2210
320.0	3.8353	-1.8[illegible]	[illegible]	5.1101	1.6373	-1.9[illegible]	0.2135
330.0	3.9477	-1.4350	1.9684	4.6299	1.2142	-1.3204	0.1274
340.0	3.6662	-0.9119	1.1019	3.9451	0.7529	-0.7169	0.0508
350.0	3.3692	-0.4[illegible]	0.[illegible]	3.4381	0.3618	-0.2223	0.0181
360.0	3.3152	-0.0015	-0.0608	3.3152	0.0034	0.1447	-0.0011

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6295	0.0006	-0.0030	3.6295	-0.2929	0.1522	-0.0005
10.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20.0	4.2988	1.0191	1.4771	4.6217	-1.0503	-0.9086	-0.1327
30.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
40.0	4.4607	2.1924	3.2422	5.9310	-1.0090	-2.5484	-0.1955
50.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
60.0	3.2674	3.1028	4.0416	6.6438	-2.4294	-3.5539	-0.2239
70.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
80.0	1.1308	5.0102	5.5011	6.7206	-2.0449	-4.1102	-0.1102
90.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
100.0	-1.0994	3.5036	5.3932	6.5157	-2.5196	-3.9603	0.0459
110.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
120.0	-3.3076	3.2461	4.9341	6.7557	-2.2196	-3.7068	-0.2058
130.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
140.0	-4.5843	2.2381	3.3257	6.0823	-1.3630	-2.5265	-0.2040
150.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
160.0	-4.0321	0.9919	1.5049	4.3903	-0.4512	-1.0500	-0.0408
170.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
180.0	-3.6545	0.0005	0.0054	3.6545	0.3427	-0.1599	-0.0029
190.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
200.0	-4.2789	-1.0177	-1.5650	4.5966	0.9961	0.6795	0.1629
210.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
220.0	-4.4190	-2.3718	-3.0162	5.8746	1.7325	2.2647	0.1662
230.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
240.0	-3.2590	-3.1671	-4.8417	6.0408	2.3709	3.4770	0.1888
250.0	-2.2729	-3.5056	-5.4709	6.7943	2.0119	3.9254	0.1779
260.0	-1.1363	-3.0722	-5.6402	6.8156	2.0711	4.1430	0.0544
270.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
280.0	1.1312	-3.6220	-5.5311	6.6971	2.0310	4.1049	-0.0459
290.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
300.0	3.5725	-3.2835	-5.0309	6.2913	2.1963	3.8015	0.2394
310.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
320.0	4.6213	-2.2596	-3.3564	6.1546	1.5467	2.4958	0.2152
330.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
340.0	4.2123	-1.0005	-1.5503	4.5507	0.4547	1.0252	0.1117
350.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
360.0	3.6295	0.0006	-0.0030	3.6295	-0.2929	0.1522	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

b) ROLL ANGLE = -60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6255	-0.0006	-0.0030	3.6295	-0.2929	0.1522	-0.0005
10.0	4.0744	0.8062	0.8074	4.1018	-0.3141	0.2000	-0.0016
20.0	4.6268	1.3886	1.3187	4.5897	-1.2690	-0.8721	-0.1189
30.0	4.8544	2.1232	2.1703	5.2177	-1.7012	-1.5611	-0.1895
40.0	4.4914	3.0016	3.1455	6.5358	-2.5479	-2.2941	-0.1651
50.0	4.5859	3.8983	3.9983	7.1951	-2.8060	-2.4425	-0.1044
60.0	3.6465	4.5272	4.8670	7.5951	-3.3177	-3.5163	-0.1491
70.0	2.4721	4.6049	5.1815	7.4883	-3.4035	-3.6409	-0.1127
80.0	1.2867	5.2056	5.6251	7.7616	-3.7163	-4.0334	-0.0515
90.0	0.0067	5.2994	5.7417	7.8967	-3.7334	-4.1240	0.0009
100.0	-1.2958	5.1979	5.6235	7.7576	-3.0660	-4.0414	-0.0322
110.0	-2.4041	4.9342	5.4345	7.4384	-3.5125	-3.9126	-0.1002
120.0	-3.7284	4.5764	4.9109	7.0750	-3.1857	-3.6109	-0.1295
130.0	-4.5913	3.6149	4.1424	6.3670	-2.9760	-3.1116	-0.1004
140.0	-5.0238	3.0751	3.2330	6.7109	-1.9723	-2.4029	-0.1614
150.0	-4.9304	2.1535	2.2086	5.6082	-1.5066	-1.8416	-0.1113
160.0	-4.3659	1.2965	1.2565	4.7102	-0.8831	-1.0944	-0.0747
170.0	-3.6000	0.4126	0.5136	3.7612	-0.1234	-0.3104	-0.0316
180.0	-3.6414	0.0012	0.0069	3.6414	0.5400	-0.1597	-0.0032
190.0	-3.7398	-0.6268	-0.5211	3.6416	0.7422	0.2451	0.0492
200.0	-4.5259	-1.5220	-1.2706	4.7705	1.1067	0.7901	0.0958
210.0	-4.9115	-2.1481	-2.1402	5.7495	1.8950	1.4614	0.1241
220.0	-4.8555	-2.9855	-3.1358	6.4970	2.2437	2.1603	0.1380
230.0	-4.4638	-3.8164	-4.0651	7.1368	2.1703	2.4664	0.1121
240.0	-3.7474	-4.5265	-4.9290	7.6816	2.3063	2.5017	0.1270
250.0	-2.5951	-5.0148	-5.2950	7.6088	2.3195	2.6407	0.0958
260.0	-1.4195	-5.3160	-5.7795	7.9567	2.0097	2.1952	0.1060
270.0	0.0000	-5.3965	-5.8187	7.9055	2.0178	2.2219	0.0826
280.0	1.3276	-5.3060	-5.7462	7.9256	2.7811	2.1799	0.0145
290.0	2.6799	-5.1567	-5.6034	7.8651	2.5188	2.0857	0.1842
300.0	3.7715	-4.8263	-5.0455	7.7437	2.1053	1.6053	0.1563
310.0	4.6208	-3.9415	-4.2104	7.3810	2.3219	1.8879	0.1797
320.0	5.0860	-3.1094	-3.2704	6.7906	1.9660	2.3969	0.1706
330.0	4.9710	-2.1263	-2.2268	5.9554	1.3590	1.4720	0.1159
340.0	4.1517	-1.1015	-1.2067	4.9516	0.7554	1.0377	0.0611
350.0	3.0540	-0.0429	-0.5429	4.0181	0.0978	0.5288	0.0201
360.0	3.6295	-0.0006	-0.0030	3.6295	-0.2929	0.1522	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

c) ROLL ANGLE = -40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6294	0.0005	-0.0030	3.6294	-0.2929	0.1521	-0.0005
10.0	4.1464	0.2760	-0.4875	4.2450	-0.4784	-0.2110	-0.0760
20.0	4.8568	1.6038	-1.1638	5.2491	-1.4978	-0.7378	-0.1185
30.0	5.1857	2.6499	-1.9454	6.1311	-2.6958	-1.3246	-0.1248
40.0	5.2126	3.7582	-2.8295	7.0125	-2.8115	-1.5802	-0.1364
50.0	4.8138	4.8441	-3.6456	7.7678	-3.2235	-1.6152	-0.1202
60.0	4.0244	5.8126	-4.4653	8.3539	-4.1594	-1.1081	-0.1086
70.0	2.7718	6.3205	-4.8515	8.4281	-4.3696	-0.3895	-0.0194
80.0	1.4054	6.6868	-5.1565	8.5502	-4.0724	-0.0547	0.0016
90.0	0.0011	6.7696	-5.2448	8.6017	-4.0011	-0.1561	0.0001
100.0	-1.4265	6.7330	-5.1868	8.6103	-4.6803	-0.6437	0.0167
110.0	-2.8518	6.4993	-5.0183	8.6846	-4.5077	-1.5378	-0.0248
120.0	-4.0848	5.8872	-4.5282	8.4866	-4.1047	-2.6593	-0.0855
130.0	-4.9841	4.9815	-3.8154	8.0117	-3.4141	-3.7964	-0.1006
140.0	-5.3808	3.8639	-2.9184	7.2302	-2.6054	-2.1729	-0.1099
150.0	-5.1903	2.6537	-2.0436	6.1358	-1.6553	-1.4036	-0.0988
160.0	-4.6855	1.5963	-1.1135	5.0659	-0.8656	-0.5117	-0.0857
170.0	-3.7847	0.7197	-0.4428	3.8773	-0.2664	-0.4004	-0.0469
180.0	-3.6631	0.0005	-0.0080	3.6631	0.3437	-0.1605	-0.0037
190.0	-3.7534	-0.6284	0.4318	3.8404	0.7251	0.1754	0.0345
200.0	-4.7810	-1.6084	1.1211	5.1220	1.3787	0.6751	0.0852
210.0	-5.1855	-2.6836	1.8542	6.1254	2.0575	1.2787	0.1140
220.0	-5.1709	-3.7288	2.7990	6.9536	2.6867	1.9111	0.0884
230.0	-4.7418	-4.7325	3.6344	7.6380	3.1724	2.5265	0.0707
240.0	-3.9885	-5.7444	4.4200	8.2656	4.0526	3.1695	0.0705
250.0	-2.7861	-6.5156	5.0550	8.4288	4.4560	3.4556	0.0116
260.0	-1.4216	-6.7374	5.2148	8.0514	4.7283	3.7265	-0.0516
270.0	0.0018	-6.6833	5.1521	8.7000	4.8444	3.8181	-0.0525
280.0	1.4762	-6.6775	5.3316	8.8195	4.8367	3.8194	-0.0055
290.0	2.9048	-6.4753	5.1024	8.8060	4.8077	3.6565	0.0344
300.0	4.0892	-5.8918	4.5389	8.1797	4.0527	3.2059	0.0671
310.0	4.9767	-4.9831	3.8126	7.9911	3.3888	2.7329	0.1102
320.0	5.3557	-3.8551	2.9118	7.2039	2.5557	2.1265	0.1167
330.0	5.1787	-2.6517	1.9421	6.1246	1.7447	1.4447	0.0924
340.0	4.7267	-1.6077	1.1245	5.1063	0.9750	0.8155	0.0560
350.0	4.6744	-0.7662	0.4754	4.1961	0.1475	0.4761	0.0659
360.0	3.6294	0.0005	-0.0030	3.6294	-0.2929	0.1521	-0.0005

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TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

d) ROLL ANGLE = -30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6258	0.0003	-0.0030	3.6258	-0.2927	0.1517	-0.0005
10.0	4.1054	0.0555	-0.3701	4.2049	-0.4810	-0.1349	-0.0590
20.0	5.0414	1.8961	0.9485	5.4611	-1.0491	-0.5806	-0.1003
30.0	5.4472	3.1030	1.6014	6.4818	-2.3991	-1.0862	-0.1124
40.0	5.4543	4.4093	2.5131	7.3749	-3.2334	-1.5456	-0.1147
50.0	5.0514	5.7001	3.0192	8.1847	-4.0808	-2.1002	-0.0971
60.0	4.1893	6.8016	3.6248	8.7654	-4.7826	-2.5400	-0.0782
70.0	2.9827	7.6057	4.0664	9.1201	-5.2700	-2.8567	-0.0584
80.0	1.6032	7.9051	4.2154	9.2770	-5.4394	-2.9567	-0.0426
90.0	-0.0017	8.1154	4.3428	9.1994	-5.6098	-3.0455	0.0390
100.0	-1.5243	8.0589	4.3198	9.2648	-5.5617	-3.0020	0.0595
110.0	-3.0208	7.7103	4.1357	9.2508	-5.3507	-2.9000	0.0278
120.0	-4.3141	6.9736	3.7215	9.1015	-4.8357	-2.6467	-0.0242
130.0	-5.1907	5.8361	3.1056	8.5977	-4.0238	-2.2582	-0.0749
140.0	-5.5478	4.4697	2.3460	7.4919	-3.0040	-1.7431	-0.0943
150.0	-5.3525	3.0523	1.5585	6.3294	-2.0019	-1.2027	-0.0716
160.0	-4.7657	1.8101	0.9662	5.1649	-1.0599	-0.7478	-0.0614
170.0	-3.8654	0.8113	0.4316	3.9831	-0.2518	-0.3938	-0.0435
180.0	-3.6512	0.0010	0.0067	3.6512	0.5409	-0.1606	-0.0034
190.0	-3.8118	-0.8062	-0.3454	3.9051	0.7588	0.1111	0.0354
200.0	-4.7655	-1.8119	-0.8846	5.1698	1.3797	0.4959	0.0611
210.0	-5.3745	-3.0659	-1.5647	6.3788	2.2951	1.0078	0.0821
220.0	-5.4749	-4.4086	-2.3075	7.3897	3.1670	1.5507	0.0902
230.0	-5.0003	-5.6363	-2.9859	8.0998	3.9120	2.0375	0.0918
240.0	-4.1930	-6.7759	-3.6216	8.7465	4.6876	2.5067	0.0905
250.0	-2.9870	-7.5983	-4.0752	9.1158	5.2457	2.8567	0.0812
260.0	-1.6950	-7.9209	-4.2524	9.1090	5.4617	2.9956	0.0654
270.0	-0.0106	-8.1144	-4.3671	8.8151	5.4247	3.0731	0.0454
280.0	1.5571	-8.1498	-4.3992	9.3870	5.6711	3.1008	-0.0476
290.0	3.0211	-7.6881	-4.1376	9.2357	5.5026	2.8764	-0.0450
300.0	4.3028	-6.9543	-3.7458	8.9823	5.1857	2.6134	-0.0255
310.0	5.2854	-5.8511	-3.1104	8.4218	4.4917	2.2272	-0.0134
320.0	5.4891	-4.4387	-2.3343	7.4258	3.0262	1.7106	0.0760
330.0	5.3753	-3.0745	-1.5773	6.5447	2.0245	1.2424	0.0000
340.0	4.6858	-1.9451	-0.9964	5.6715	1.0677	0.7857	-0.0242
350.0	3.9484	-0.8634	-0.4606	4.8926	0.2044	0.3004	0.0001
360.0	3.6258	0.0003	-0.0030	3.6258	-0.2927	0.1517	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

a) ROLL ANGLE = -20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X_ℓ, Y_ℓ, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	5.6287	0.0004	-0.0029	5.6287	-0.2928	0.1521	-0.0005
10.0	4.0506	0.9100	-0.2956	4.1506	-0.9868	-0.0402	-0.0399
20.0	5.0882	2.0444	-0.6522	5.5218	-1.7656	-0.3495	-0.0869
30.0	5.6452	3.4612	-1.1009	6.7085	-2.8401	-0.7205	-0.1458
40.0	5.5973	4.8779	-1.6319	7.5927	-3.5151	-1.0877	-0.1966
50.0	5.1650	6.3017	-2.1251	8.4129	-4.4109	-1.4458	-0.2397
60.0	4.3020	7.5504	-2.5555	9.0523	-5.2146	-1.7621	-0.0537
70.0	3.0460	8.4685	-2.8734	9.4629	-5.7895	-1.9998	-0.0116
80.0	1.5600	8.8539	-2.9996	9.4747	-6.0165	-2.0771	0.0521
90.0	-0.0021	8.6387	-2.9260	9.1402	-5.8042	-2.1257	0.0434
100.0	-1.5950	8.0928	-3.0599	8.6295	-6.1332	-2.1096	0.0503
110.0	-3.0946	8.5364	-2.9031	9.3291	-5.8704	-2.0089	0.0434
120.0	-4.3674	7.6461	-2.6013	9.1767	-5.2711	-1.8526	0.0454
130.0	-5.2367	6.3752	-2.1542	8.5198	-4.3810	-1.5582	0.0486
140.0	-5.5760	4.8631	-1.6182	7.5645	-3.3355	-1.2258	0.0569
150.0	-5.4960	3.3037	-1.1030	6.5388	-2.2315	-0.8236	0.0712
160.0	-4.8166	1.9697	-0.6104	5.2306	-1.1407	-0.5055	0.0620
170.0	-3.9552	0.8042	-0.2567	4.0542	-0.4943	-0.3258	0.0306
180.0	-3.6633	0.0011	0.0081	3.6633	0.3429	-0.1603	-0.0036
190.0	-3.9738	-0.8404	0.2506	4.0739	0.8261	-0.0395	-0.0317
200.0	-4.8271	-1.9758	0.6153	5.2427	1.4800	0.5012	-0.0568
210.0	-5.4199	-3.3378	1.0829	6.6418	2.3691	0.8429	-0.0697
220.0	-5.5860	-4.6415	1.5124	7.8129	3.4100	1.0957	0.0683
230.0	-5.1332	-6.0491	2.0989	8.5877	4.2960	1.4048	0.0995
240.0	-4.2825	-7.4911	2.5414	8.9981	5.0955	1.7518	0.0911
250.0	-3.0730	-8.4489	2.8728	9.4349	5.7444	1.9760	0.0459
260.0	-1.5714	-8.8581	3.0124	9.4847	6.0160	2.1093	0.0424
270.0	0.0096	-8.8420	3.0063	8.8514	6.1715	2.1301	-0.0005
280.0	1.6103	-8.0591	3.7056	8.7069	6.2220	2.1613	-0.0535
290.0	3.0984	-6.5194	2.9059	8.5165	5.0540	2.0031	-0.0500
300.0	4.3950	-7.0619	2.6194	9.2002	5.2671	1.8280	0.0174
310.0	5.2220	-4.3634	1.6548	6.5062	4.3806	1.5451	0.0418
320.0	5.6345	-4.9890	1.5400	7.6418	3.5445	1.2143	0.0647
330.0	5.4832	-3.7772	1.1020	6.5246	2.2410	0.8853	0.0451
340.0	4.9788	-2.0264	0.6301	5.3054	1.1383	0.5514	0.0227
350.0	3.9452	-0.8874	0.2470	4.0446	0.4074	0.3401	0.0319
360.0	3.6287	0.0004	-0.0029	3.6287	-0.2928	0.1521	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

f) ROLL ANGLE = -10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_ℓ	C_m	C_n	C_ℓ
0.0	3.6272	0.0004	-0.0028	3.6272	-0.2928	0.1520	-0.0005
10.0	4.0436	0.4457	0.1551	4.1014	-0.0947	0.0500	-0.0311
20.0	4.9325	2.1110	0.3220	5.3051	-1.6288	-0.0978	-0.0572
30.0	5.4791	3.5913	0.5794	6.6454	-2.6878	-0.2985	-0.0801
40.0	5.8355	5.1820	0.8497	7.7363	-3.8651	-0.5170	-0.0921
50.0	5.2050	6.6372	1.0980	8.0907	-4.8022	-0.7131	-0.0752
60.0	4.3178	7.9252	1.3154	9.1157	-5.3785	-0.8866	-0.0358
70.0	3.0711	8.8842	1.4861	9.5145	-5.9461	-1.0188	-0.0020
80.0	1.5344	9.4968	1.5657	9.6566	-6.3200	-1.1741	0.0314
90.0	-0.0035	9.5410	1.5698	9.6785	-6.4306	-1.0950	0.0422
100.0	-1.6057	9.4568	1.5772	9.7197	-6.4112	-1.0836	0.0436
110.0	-3.0430	8.4182	1.4922	9.5508	-6.1051	-1.0314	0.0529
120.0	-4.2862	7.8848	1.3044	9.0658	-5.4172	-0.9294	0.0055
130.0	-5.1702	6.0029	1.0878	8.4492	-4.3178	-0.8184	-0.0427
140.0	-5.5279	5.0519	0.8217	7.5242	-3.4127	-0.6668	-0.0615
150.0	-5.4223	3.5010	0.5579	6.4841	-2.2729	-0.5080	-0.0431
160.0	-5.0906	2.0652	0.3167	5.2661	-1.1952	-0.3514	-0.0565
170.0	-5.4614	0.9222	0.1310	4.0827	-0.3300	-0.2390	-0.0301
180.0	-3.6616	0.0011	0.0082	3.6616	0.5429	-0.1603	-0.0036
190.0	-4.0078	-0.9325	-0.1410	4.1100	0.8298	-0.0439	0.0252
200.0	-4.7460	-2.0562	-0.3124	5.2197	1.4558	0.1581	0.0461
210.0	-5.3655	-3.4726	-0.5498	6.4882	2.3036	0.2718	0.0519
220.0	-5.5833	-5.0874	-0.8262	7.5895	3.4368	0.4913	0.0558
230.0	-5.1927	-6.6035	-1.0810	8.4506	4.3529	0.6719	0.0458
240.0	-4.3977	-7.8936	-1.3089	9.0825	5.3158	0.8711	0.0721
250.0	-3.0892	-8.9025	-1.4835	9.5370	5.9647	1.0106	0.0588
260.0	-1.5978	-9.4044	-1.5659	9.6659	6.3018	1.0722	0.0550
270.0	0.0050	-9.5465	-1.5942	9.6180	6.4153	1.0911	0.0604
280.0	1.6079	-9.4822	-1.5921	9.7475	6.4351	1.0931	0.0458
290.0	3.0800	-8.8954	-1.4951	9.5201	6.1414	1.0345	0.0210
300.0	4.3025	-7.8492	-1.3159	9.0501	5.4155	0.9079	0.0000
310.0	5.1808	-6.0151	-1.0941	8.4696	4.3534	0.8044	0.0501
320.0	5.6234	-5.1255	-0.8408	7.6460	3.4482	0.6578	0.0716
330.0	5.4345	-3.5168	-0.5547	6.4832	2.3034	0.4754	0.0629
340.0	4.3012	-2.0598	-0.3110	5.2259	1.3110	0.3201	0.0411
350.0	2.6241	-0.9306	-0.1305	4.0747	0.4501	0.2083	0.0267
360.0	3.6272	0.0004	-0.0028	3.6272	-0.2928	0.1520	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

g) ROLL ANGLE = 0°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	5.6266	0.0004	-0.0027	5.6266	-0.2928	0.1519	-0.0005
10.0	4.0537	0.9591	-0.0026	4.1585	-0.9153	0.1480	-0.0240
20.0	4.9247	2.1378	-0.0046	5.3586	-1.6157	0.1386	-0.0447
30.0	5.4216	3.5639	-0.0049	6.4771	-2.4657	0.1191	-0.0604
40.0	5.4574	5.0823	-0.0059	7.4473	-3.3861	0.0969	-0.0654
50.0	5.1140	6.6858	-0.0018	8.3780	-4.4730	0.0604	-0.0675
60.0	4.2581	7.9616	-0.0017	9.0239	-5.3411	0.0287	-0.0462
70.0	3.0336	8.9220	-0.0052	9.4214	-5.9535	0.0127	-0.0259
80.0	1.5460	9.4771	-0.0044	9.6043	-6.3169	0.0048	-0.0126
90.0	-0.0023	9.7807	-0.0036	9.7807	-6.5663	0.0002	0.0151
100.0	-1.5747	9.4319	+0.0012	9.5619	-6.5719	-0.0073	0.0009
110.0	-2.9443	8.8179	0.0013	9.1101	-6.3677	-0.0264	-0.0184
120.0	-4.2033	7.9718	0.0026	8.5217	-5.9226	-0.0419	-0.0409
130.0	-5.0706	6.5900	0.0006	8.3074	-4.9114	-0.0645	-0.0558
140.0	-5.4567	5.0734	0.0035	7.4411	-3.5760	-0.0934	-0.0606
150.0	-5.4049	3.5462	0.0049	6.4362	-2.2541	-0.1136	-0.0521
160.0	-4.8457	2.1094	0.0020	5.5200	-1.2155	-0.1290	-0.0415
170.0	-4.0348	0.9464	0.0026	4.1378	-0.5372	-0.1402	-0.0259
180.0	-3.6592	0.0011	0.0083	3.6592	0.3429	-0.1603	-0.0036
190.0	-4.0772	-0.9558	0.0043	4.1812	1.0059	-0.1474	0.0170
200.0	-4.8456	-2.1161	0.0049	5.3147	1.9607	-0.1474	0.0381
210.0	-5.4285	-3.5695	0.0011	6.4814	2.4070	-0.1248	0.0538
220.0	-5.5281	-5.1280	-0.0026	7.5309	3.5984	-0.0701	0.0602
230.0	-5.1591	-6.6843	-0.0055	8.4366	4.3054	-0.0504	0.0553
240.0	-4.2772	-7.9724	-0.0056	9.0429	5.3274	-0.0356	0.0459
250.0	-3.0271	-8.9436	-0.0017	9.3920	5.9367	-0.0155	0.0258
260.0	-1.5867	-9.4171	-0.0011	9.5363	6.2475	-0.0052	-0.0060
270.0	-0.0014	-9.6792	-0.0050	9.6792	6.4765	0.0020	-0.0261
280.0	1.5599	-9.3960	-0.0043	9.5240	6.3863	0.0034	-0.0455
290.0	2.9734	-8.7757	-0.0050	9.2616	6.1797	0.0127	-0.0547
300.0	4.1849	-7.8346	-0.0029	8.7774	5.8716	0.0202	-0.0575
310.0	5.0581	-6.5863	-0.0033	8.2965	4.5964	0.0528	0.0520
320.0	5.4506	-5.0617	-0.0066	7.4136	3.4880	0.0463	0.0594
330.0	5.3861	-3.5400	-0.0056	6.4548	2.5644	0.1070	0.0526
340.0	4.8112	-2.0940	-0.0033	5.2472	1.5157	0.1253	0.0352
350.0	4.0138	-0.9897	-0.0039	4.1177	0.4394	0.1455	0.0219
360.0	5.6266	0.0004	-0.0027	5.6266	-0.2928	0.1519	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

h) ROLL ANGLE = 10°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6266	0.0004	-0.0027	3.6266	-0.2928	0.1519	-0.0005
10.0	3.9773	0.9337	-0.1301	4.0804	-0.8345	0.2340	-0.0169
20.0	4.8419	2.0776	-0.3136	5.2682	-1.5244	0.3428	-0.0320
30.0	5.4869	3.5448	-0.5593	6.5474	-2.3006	0.4086	-0.0419
40.0	5.6164	5.1194	-0.8338	7.6360	-3.4949	0.6579	-0.0595
50.0	5.1940	6.6239	-1.0926	8.4809	-4.4689	0.8092	-0.0640
60.0	4.3472	7.9734	-1.3264	9.1732	-5.3432	0.9398	-0.0595
70.0	3.1016	8.9692	-1.5061	9.6066	-6.0074	1.0466	-0.0466
80.0	1.6108	9.5124	-1.5945	9.7777	-6.3794	1.0928	-0.0350
90.0	0.0028	9.5402	-1.5987	9.6727	-6.4022	1.0909	-0.0117
100.0	-1.5934	9.3992	-1.5654	9.6600	-6.3623	1.0639	-0.0356
110.0	-3.0226	8.7845	-1.3565	9.3824	-5.9854	0.9751	-0.0700
120.0	-4.2063	7.8080	-1.2793	8.9750	-5.3661	0.8415	-0.0877
130.0	-5.1167	6.5368	-1.0680	8.3623	-4.4539	0.6709	-0.0627
140.0	-5.4703	5.0023	-0.8047	7.4468	-3.3645	0.4681	-0.0627
150.0	-5.3518	3.4596	-0.5377	6.5849	-2.2520	0.2706	-0.0410
160.0	-4.8108	2.0514	-0.3014	5.2370	-1.1891	0.1017	-0.0259
170.0	-3.9371	0.9169	-0.1230	4.0377	-0.3411	-0.0575	-0.0166
180.0	-3.6542	0.0012	0.0084	3.6542	0.3410	-0.1605	-0.0036
190.0	-4.0937	-0.9463	0.1422	4.1978	0.8932	-0.2504	0.0108
200.0	-4.9234	-2.0965	0.3506	5.3529	1.5429	-0.3052	0.0284
210.0	-5.4760	-3.5296	0.5658	6.5294	2.4774	-0.5329	0.0463
220.0	-5.6121	-5.1157	0.8363	7.6307	3.4706	-0.6780	0.0562
230.0	-5.1940	-6.6225	1.0939	8.4794	4.4866	-0.8561	0.0625
240.0	-4.3211	-7.9175	1.3165	9.1109	5.3178	-0.9524	0.0588
250.0	-3.1215	-8.9769	1.5049	9.6202	6.0476	-1.0582	0.0458
260.0	-1.6101	-9.4552	1.5773	9.7773	6.3184	-1.0648	0.0445
270.0	-0.0020	-9.5212	1.5840	9.6515	6.3804	-1.0798	0.0331
280.0	1.5806	-9.3751	1.5585	9.6339	6.3732	-1.0646	0.0556
290.0	3.0020	-8.7223	1.4445	9.3340	5.9206	-0.9775	0.0858
300.0	4.2025	-7.7501	1.2784	8.9031	5.3757	-0.8539	0.0767
310.0	5.1420	-6.5641	1.0813	8.4009	4.5231	-0.6927	0.0578
320.0	5.6218	-5.1228	0.8404	7.6427	3.4717	-0.5119	0.0409
330.0	5.0451	-3.5540	0.5842	6.5418	2.3474	-0.3015	0.0342
340.0	4.2246	-2.0669	0.3427	5.2490	1.3189	-0.1475	0.0314
350.0	4.0268	-0.9389	0.1501	4.1241	0.4256	0.0514	0.0153
360.0	3.6266	0.0004	-0.0027	3.6266	-0.2928	0.1519	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 20°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.0251	0.0005	-0.0027	3.0251	-0.2928	0.1516	-0.0005
10.0	3.9720	0.8960	-0.2476	4.0724	-0.8401	0.3113	-0.0071
20.0	3.9475	2.0334	-0.6313	5.4234	-1.6748	0.5737	-0.0028
30.0	3.8024	3.4566	-1.1210	6.9587	-2.5566	0.8487	-0.0105
40.0	3.6894	4.9510	-1.6434	8.6428	-3.4964	1.2657	-0.0362
50.0	5.2163	6.3586	-2.1461	8.4928	-4.3608	1.5435	-0.0507
60.0	4.3977	7.6888	-2.6081	9.8284	-5.2080	1.8172	-0.0449
70.0	5.1059	8.5416	-2.9002	9.5360	-5.7253	1.9659	-0.0426
80.0	1.5529	9.0156	-3.0740	9.0560	-6.0631	2.1008	-0.0352
90.0	0.0092	8.9818	-3.0546	9.4847	-6.0530	2.0760	-0.0327
100.0	-1.5577	8.7751	-2.9656	9.5898	-5.9553	2.0155	-0.0732
110.0	-2.9502	8.2944	-2.8093	9.2496	-5.8758	1.8965	-0.1005
120.0	-4.1736	7.5554	-2.4726	8.7934	-5.0163	1.6536	-0.0867
130.0	-5.0641	6.1770	-2.0657	8.2428	-4.1921	1.3629	-0.0455
140.0	-5.4708	4.7756	-1.5606	7.4248	-3.2554	1.0170	-0.0237
150.0	-5.4065	3.3343	-1.0735	6.4521	-2.3411	0.6965	-0.0505
160.0	-5.2566	1.9459	-0.5917	5.1845	-1.1297	0.2852	-0.0134
170.0	-3.9519	0.8797	-0.2380	4.0298	-0.5130	0.0334	-0.0058
180.0	-3.6533	0.0010	0.0080	3.6533	0.3420	-0.1597	-0.0035
190.0	-4.1128	-0.5894	0.2044	4.2044	0.9864	-0.3525	-0.0112
200.0	-4.4567	-1.5015	0.5238	5.2753	1.9197	-0.5908	-0.0108
210.0	-5.4920	-3.3774	1.1055	6.5320	2.4868	-0.5092	0.0324
220.0	-5.6305	-4.8991	1.6372	7.6323	3.4162	-1.2403	0.0424
230.0	-5.2547	-6.3972	2.1637	8.2554	4.4268	-1.5041	0.0554
240.0	-4.3966	-7.4863	2.6095	8.2085	5.2461	-1.6826	0.0573
250.0	-3.1150	-8.0535	2.8977	8.3422	5.7946	-1.7363	0.0479
260.0	-1.5857	-8.0221	3.0858	8.3501	5.9642	-1.7185	0.0289
270.0	-0.0027	-8.0678	3.0462	8.0695	6.0819	-1.6967	0.0710
280.0	1.5493	-8.0791	2.9744	8.3450	5.9923	-1.8566	0.1016
290.0	2.9876	-8.0772	2.8057	8.2827	5.7601	-1.9655	0.1166
300.0	4.2125	-7.4825	2.5010	8.0310	5.1455	-1.7710	0.0912
310.0	5.0560	-6.1659	2.0803	8.2485	4.3214	-1.4105	0.0595
320.0	5.5226	-4.6231	1.6066	7.4964	3.3292	-1.0051	0.0353
330.0	5.5582	-3.4015	1.1218	6.5044	2.2588	-0.7158	0.0073
340.0	5.4536	-2.0258	0.6569	5.5527	1.1370	-0.3275	-0.0012
350.0	5.9823	-0.8956	0.2467	4.6825	0.3939	-0.0516	0.0071
360.0	3.0251	0.0005	-0.0027	3.0251	-0.2928	0.1516	-0.0005

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TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

j) ROLL ANGLE = 30°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	5.6295	0.0006	-0.0030	5.6295	-0.2929	0.1562	-0.0005
10.0	5.9907	0.8386	-0.3628	6.0878	-0.0898	0.3925	0.0119
20.0	6.8955	1.8519	-0.9098	7.3043	-1.5078	0.7711	0.0102
30.0	5.4578	3.1099	-1.5920	6.4708	-2.3463	1.2261	0.0071
40.0	5.4995	4.4410	-2.3239	7.4518	-3.1551	1.6908	-0.0062
50.0	5.1689	5.8103	-3.0816	8.3573	-4.0466	2.1896	-0.0084
60.0	4.2790	6.9138	-3.6905	8.9228	-4.7201	2.5642	-0.0148
70.0	3.0210	7.6919	-4.1202	9.2287	-5.2054	2.8307	-0.0284
80.0	1.5355	8.0654	-4.3555	9.2791	-5.4941	3.0066	-0.0159
90.0	0.0102	8.1417	-4.3738	9.2377	-5.5750	3.0305	-0.0161
100.0	-1.4954	7.9158	-4.2399	9.0983	-5.4412	2.9328	-0.0632
110.0	-2.9447	7.5144	-4.0140	9.0062	-5.1568	2.7486	-0.0490
120.0	-4.1268	6.6955	-3.5601	8.6204	-4.5701	2.4203	-0.0502
130.0	-4.9257	5.5579	-2.9370	7.9782	-3.7796	1.9776	-0.0298
140.0	-5.3619	4.3226	-2.2488	7.2365	-2.8937	1.5101	0.0024
150.0	-5.2723	3.0104	-1.5214	6.2497	-1.9738	0.9892	-0.0044
160.0	-4.6943	1.7459	-0.8867	5.0873	-1.0627	0.4763	-0.0116
170.0	-3.8712	0.8105	-0.3437	3.9641	-0.2562	0.1057	0.0045
180.0	-3.6545	0.0005	0.0054	3.6545	0.3427	-0.1599	-0.0029
190.0	-3.9495	-0.8241	0.3820	4.0448	0.8525	-0.4136	-0.0084
200.0	-4.8563	-1.8364	0.9006	5.2578	1.4735	-0.7949	0.0048
210.0	-5.3754	-3.0695	1.5746	6.3780	2.2649	-1.2430	0.0127
220.0	-5.5805	-4.4895	2.3616	7.5330	3.2167	-1.7508	0.0008
230.0	-5.1652	-5.8050	3.0874	8.3524	4.0705	-2.2458	0.0247
240.0	-4.2751	-6.9002	3.6679	8.9096	4.7616	-2.6205	0.0461
250.0	-3.0186	-7.6791	4.1228	9.2165	5.2625	-2.9051	0.0556
260.0	-1.5206	-7.9840	4.2824	9.1918	5.4176	-2.9815	0.0762
270.0	-0.0001	-8.0915	4.3392	9.1770	5.5554	-3.0194	0.0647
280.0	1.4771	-7.8309	4.1764	8.9916	5.5935	-2.9800	0.1303
290.0	2.9257	-7.4770	3.9972	8.5967	5.2373	-2.7959	0.0956
300.0	4.1077	-6.6774	3.5539	7.8967	4.6961	-2.4762	0.0745
310.0	4.9830	-5.6274	2.9798	8.6775	3.9076	-2.0669	0.0315
320.0	5.3142	-4.3103	2.2546	7.1949	2.9849	-1.5394	0.0182
330.0	5.1263	-3.0450	1.5648	6.3184	2.0480	-1.0435	-0.0045
340.0	4.9608	-1.8021	0.9124	5.2643	1.0705	-0.5557	-0.0171
350.0	4.0247	-0.8392	0.3687	4.1217	0.2459	-0.1234	-0.0146
360.0	5.6295	0.0006	-0.0030	5.6295	-0.2929	0.1562	-0.0005

TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

k) ROLL ANGLE = 40°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6295	0.0006	-0.0030	3.6295	-0.2929	0.1522	-0.0005
10.0	3.9731	0.7531	-0.4618	[illegible]	-0.8468	0.4654	0.0252
20.0	4.6970	1.6011	-1.1178	[illegible]	-1.3341	0.9114	0.0292
30.0	5.1624	2.6405	-1.9264	6.1013	-1.9900	1.4474	0.0269
40.0	5.4341	3.8311	-2.8803	7.1625	-2.7856	2.0848	0.0376
50.0	4.8975	4.9110	-3.7420	7.0[illegible]	-3.4515	2.6551	0.0368
60.0	4.0625	[illegible]	-4.4998	[illegible]	-4.0404	3.1298	0.0315
70.0	2.8967	6.5603	-5.0797	6.7612	-4.5681	3.5794	0.0415
80.0	1.4554	6.8286	-5.4846	6.7493	-4.7320	3.7122	0.0454
90.0	0.0107	6.8872	-5.3282	6.7[illegible]	-4.7704	3.7357	0.0319
100.0	-1.4014	6.6679	-5.1452	6.9384	-4.6299	3.5964	-0.0041
110.0	-2.7979	6.3652	-4.8984	6.4975	-4.4176	3.4240	-0.0502
120.0	-3.9126	5.8582	-4.5426	6.1272	-3.8836	2.9789	-0.0550
130.0	-4.6772	4.7107	-3.5727	7.5299	-3.2487	2.4669	-0.0262
140.0	-5.1266	3.6926	-2.7712	6.8904	-2.4930	1.8888	0.0106
150.0	-5.0794	2.5928	-1.8812	5.9964	-1.6197	1.2357	0.0241
160.0	-4.5351	1.5500	-1.0690	4.9027	-0.8551	0.6122	0.0135
170.0	-3.7332	0.7094	-0.4290	3.8187	-0.2179	0.1619	0.0101
180.0	-3.6414	0.0012	0.0069	3.6414	0.3400	-0.1597	-0.0032
190.0	-3.8389	-0.7278	0.4511	3.9277	0.7667	-0.4652	-0.0175
200.0	-4.6582	-1.5874	1.1107	5.0374	1.3257	-0.9228	-0.0245
210.0	-5.1999	-2.6538	1.9883	6.1459	2.0268	-1.4990	-0.0259
220.0	-5.3044	-3.8125	2.8825	7.1316	2.7671	-2.1372	-0.0202
230.0	-4.9002	-4.9105	3.7503	7.8779	3.4903	-2.7217	-0.0149
240.0	-4.0386	-5.8184	4.4762	8.3709	4.0863	-3.2119	[illegible]
250.0	-2.8452	-6.4602	4.9915	8.6383	4.4554	-3.5076	[illegible]
260.0	-1.4367	-6.7489	5.2120	8.6403	4.6428	-3.6412	[illegible]
270.0	0.0005	-6.8427	5.2855	8.6392	4.7565	-3.7272	0.0392
280.0	1.3771	-6.5710	5.0395	8.3862	4.5793	-3.5169	0.1427
290.0	2.7360	-6.2436	4.7917	8.3248	4.3353	-3.3562	[illegible]
300.0	3.9608	-5.7508	4.4051	8.2373	4.0309	-3.1173	[illegible]
310.0	4.7420	-4.7747	3.6277	7.6361	3.3347	-2.5560	0.0086
320.0	5.1567	-3.7226	2.7970	6.9387	2.5285	-1.9424	-0.0218
330.0	5.0312	-2.5858	1.8869	5.9539	1.8655	-1.2595	-0.0122
340.0	4.7185	-1.4052	1.1261	5.1020	0.8598	-0.6851	-0.0404
350.0	4.0698	-0.7607	0.4771	4.1624	0.1316	-0.2019	-0.0340
360.0	3.6295	0.0006	-0.0030	3.6295	-0.2929	0.1522	-0.0005

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TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

1) ROLL ANGLE = 90°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6294	0.0005	-0.0030	3.6294	-0.2929	0.1521	-0.0005
10.0	3.9551	0.6506	-0.5427	3.8390	-0.4284	0.3307	0.0393
20.0	4.5299	1.3290	-1.2807	4.3644	-1.1911	1.0385	0.0534
30.0	4.9527	2.1613	-2.2108	5.0304	-1.8895	1.6718	0.0565
40.0	5.0508	3.0891	-3.2463	6.7438	-2.3562	2.3773	0.0949
50.0	4.6164	3.9331	-4.1937	7.3448	-2.8761	3.0205	0.0970
60.0	3.7858	4.6389	-4.9979	7.7988	-3.3006	3.5422	0.0945
70.0	2.7088	5.2027	-5.6555	8.1400	-3.7407	4.0654	0.1318
80.0	1.3608	5.4265	-5.9025	8.1250	-3.8906	4.2764	0.1566
90.0	0.0114	5.4099	-5.9380	8.0517	-3.8670	4.2874	0.0695
100.0	-1.3061	5.2982	-5.7537	7.9210	-3.7423	4.1446	0.0036
110.0	-2.5298	4.8974	-5.2478	7.6009	-3.4524	3.7980	0.0387
120.0	-3.6869	4.5232	-4.8646	7.5865	-3.1200	3.4668	0.0724
130.0	-4.3780	3.7562	-3.9889	7.0043	-2.5962	2.8392	0.0375
140.0	-4.8666	2.9474	-3.1317	6.5043	-1.9346	2.1781	0.0766
150.0	-4.9021	2.1405	-2.1800	5.7641	-1.3127	1.4874	0.0618
160.0	-4.3742	1.2854	-1.2281	4.7143	-0.6657	0.7576	0.0354
170.0	-3.6994	0.6123	-0.5084	3.7791	-0.1303	0.2205	0.0215
180.0	-3.6631	0.0005	0.0080	3.6631	0.5837	-0.1605	-0.0037
190.0	-3.7343	-0.6177	0.5174	3.8153	0.6899	-0.5123	-0.0245
200.0	-4.4416	-1.3045	1.2575	4.7899	1.1111	-1.0286	-0.0352
210.0	-4.9821	-2.1676	2.2306	5.8656	1.7099	-1.7171	-0.0581
220.0	-5.0331	-3.0774	3.2437	6.7241	2.3677	-2.4415	-0.0833
230.0	-4.5995	-3.9156	4.1795	7.3370	2.8628	-3.0758	-0.0711
240.0	-3.7666	-4.6065	4.9675	7.7441	3.3412	-3.6336	-0.0561
250.0	-2.6478	-5.0932	5.5165	7.9529	3.6353	-3.9750	-0.0725
260.0	-1.3054	-5.2305	5.6443	7.7956	3.6722	-4.0145	-0.0545
270.0	0.0007	-5.3083	5.7334	7.8041	3.7332	-4.0973	0.0322
280.0	1.2512	-5.1006	5.4777	7.5782	3.5838	-3.8808	0.0582
290.0	2.4170	-4.7150	5.0216	7.2693	3.2774	-3.5122	0.0469
300.0	3.6478	-4.4013	4.8162	7.5149	3.1440	-3.4765	-0.0626
310.0	4.3789	-3.7496	3.9775	6.9949	2.6098	-2.8583	-0.0466
320.0	4.8496	-2.9797	3.1168	6.4807	1.9815	-2.2078	-0.0622
330.0	4.8252	-2.1121	2.1556	5.8024	1.3620	-1.4955	-0.0517
340.0	4.4461	-1.3141	1.2746	4.2503	0.8803	-0.8504	-0.0583
350.0	3.9804	-0.6473	0.5514	4.0655	0.0421	-0.2564	-0.0472
360.0	3.6294	0.0005	-0.0030	3.6294	-0.2929	0.1521	-0.0005

TABLE IX - SPACE OPERATIONS CENTER SOLAR PANELS AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED, DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

$AREA_{REF}$ = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

PANEL	α	φ	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
-Y SIDE	0°	0°	.4312	0	0	.4312	.0278	-1.1420	0
	30°	↓	1.5884	1.1670	↓	1.9592	-.6116	-4.2071	3.0909
	60°	↓	1.5884	3.2159	↓	3.5013	-1.8027	-4.2070	8.2789
	90°	↓	0	4.0888	↓	4.0888	-2.4860	0	10.8289
	0°	30°	.4312	0	0	.4312	.0277	-1.1420	0
	30°	↓	1.3758	.9149	-.3972	1.6869	-.4714	-3.4024	2.3986
	60°	↓	1.3756	2.3986	-1.1913	3.0025	-1.3735	-2.9191	6.2791
	90°	↓	0	3.1258	-1.5884	3.5012	-1.9006	.9658	8.1809
	0°	60°	.4312	0	0	.4312	.0278	-1.1420	0
	30°	↓	.8029	.3939	-.4014	.9675	-.1900	-1.8822	1.0185
	60°	↓	.7943	.9149	-1.1915	1.6879	-.5073	-1.3794	2.3497
↓	90°	↓	0	1.1014	-1.4991	1.8490	-.6733	.9164	2.8751
+Y SIDE	0°	0°	.4312	0	0	.4312	.0278	1.1420	0
	30°	↓	1.5885	1.1671	↓	1.9592	-.2780	4.2072	-3.0909
	60°	↓	1.5885	3.1258	↓	3.5013	-2.1142	4.2071	-8.2788
	90°	↓	0	4.0887	↓	4.0887	-2.8935	0	-10.8290
	0°	30°	.4312	0	0	.4312	.0278	1.1420	0
	30°	↓	1.3758	.9149	-.3972	1.6869	-.5626	3.9249	-2.4477
	60°	↓	1.3756	2.3985	-1.1913	3.0025	-1.6126	4.4865	-6.4261
	90°	↓	0	3.1258	-1.5884	3.5013	-2.2122	1.1241	-8.3768
	0°	60°	.4312	0	0	.4312	.0278	1.1420	0
	30°	↓	.8028	.3939	-.4014	.9676	-.2293	2.4104	-1.0689
	60°	↓	.7944	.9149	-1.1915	1.6869	-.5985	2.9470	-2.4966
↓	90°	↓	0	1.1670	-1.5885	1.9592	-.8259	1.1242	-3.1889

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TABLE VIII - SPACE OPERATIONS CENTER EIGHTH STAGE BUILDUP
AERODYNAMIC CHARACTERISTICS BASED UPON FULLY ACCOMMODATED,
DIFFUSE PARTICLE REFLECTION, FREE MOLECULAR FLOW

m) ROLL ANGLE = 60°

A_{REF} = 249.91 m^2 L_{REF} = 17.837 m ALTITUDE = 490 km

MOMENT REFERENCE CENTER AT X, Y, Z = 0, 0, 0

ALPHA	C_A	C_N	C_Y	C_D	C_m	C_n	C_ℓ
0.0	3.6258	0.0003	-0.0030	3.6258	-0.2927	0.1517	-0.0005
10.0	3.8582	0.5228	-0.4060	3.8961	-0.3483	0.5846	0.0437
20.0	4.2006	1.0054	-1.3401	4.3161	-0.9708	1.0825	0.0731
30.0	4.5462	1.5991	-2.2872	5.3272	-1.5365	1.7306	0.0953
40.0	4.5867	2.2432	-3.3240	6.0848	-1.8134	2.4524	0.1552
50.0	4.1808	2.8379	-4.2922	6.0000	-2.1794	3.1297	0.1711
60.0	3.4207	3.3314	-5.1839	6.0007	-2.4919	3.7227	0.1856
70.0	2.3887	3.8635	-5.6523	7.1380	-2.7441	4.1686	0.2757
80.0	1.1778	3.7448	-5.7888	6.9854	-2.7628	4.3157	0.2611
90.0	0.0100	3.6344	-5.6765	6.7388	-2.6380	4.2034	-0.1846
100.0	-1.0784	3.5079	-5.4171	6.5308	-2.5620	3.9699	-0.2327
110.0	-2.2671	3.5052	-5.3609	6.7044	-2.4645	3.9784	0.1837
120.0	-3.2108	3.1499	-4.7754	6.5508	-2.1413	3.4955	0.1710
130.0	-4.0026	2.7285	-4.1148	6.3496	-1.8013	2.9644	0.1296
140.0	-4.3500	2.1428	-3.1650	5.7827	-1.3322	2.1930	0.0954
150.0	-4.4908	1.5731	-2.2600	5.2610	-0.8986	1.5638	0.0513
160.0	-4.1129	0.9807	-1.5037	4.4167	-0.4332	0.8282	0.0575
170.0	-3.6278	0.4965	-0.5670	3.7011	-0.0674	0.2542	0.0243
180.0	-3.6512	0.0010	0.0067	3.6512	0.3409	-0.1606	-0.0034
190.0	-3.7318	-0.5071	0.5845	3.8070	0.8441	-0.5869	-0.0565
200.0	-4.1796	-0.9966	1.5554	4.4929	0.9109	-1.0765	-0.0519
210.0	-4.6122	-1.6133	2.3292	5.4062	1.3891	-1.6271	-0.1008
220.0	-4.5842	-2.2394	3.3303	6.0858	1.8514	-2.5544	-0.1447
230.0	-4.1231	-2.8006	4.2585	6.5347	2.1690	-3.1775	-0.1563
240.0	-3.3648	-3.2755	5.0102	6.8583	2.4049	-3.7486	-0.1561
250.0	-2.3177	-3.5869	5.4666	6.9144	2.6258	-4.0093	-0.1655
260.0	-1.1169	-3.5965	5.4753	6.8319	2.5828	-3.9961	-0.1113
270.0	0.0026	-3.5461	5.3689	6.4226	2.5490	-3.9344	0.2480
280.0	1.0412	-3.4290	5.1773	6.2847	2.4674	-3.7267	0.1874
290.0	2.1151	-3.2925	4.9650	6.3254	2.2938	-3.5791	-0.0775
300.0	3.1949	-3.1150	4.7505	6.4933	2.1886	-3.5176	-0.1504
310.0	3.9770	-2.7063	4.0835	6.3019	1.8319	-3.0117	-0.1344
320.0	4.3618	-2.1465	3.1621	5.7913	1.3790	-2.2623	-0.0982
330.0	4.0151	-1.5579	2.2205	5.1744	0.9354	-1.5412	-0.0758
340.0	4.1411	-0.9960	1.3410	4.4964	0.4248	-0.8750	-0.0615
350.0	3.9353	-0.5256	0.6225	4.0147	-0.0532	-0.3213	-0.0599
360.0	3.6258	0.0003	-0.0030	3.6258	-0.2927	0.1517	-0.0005

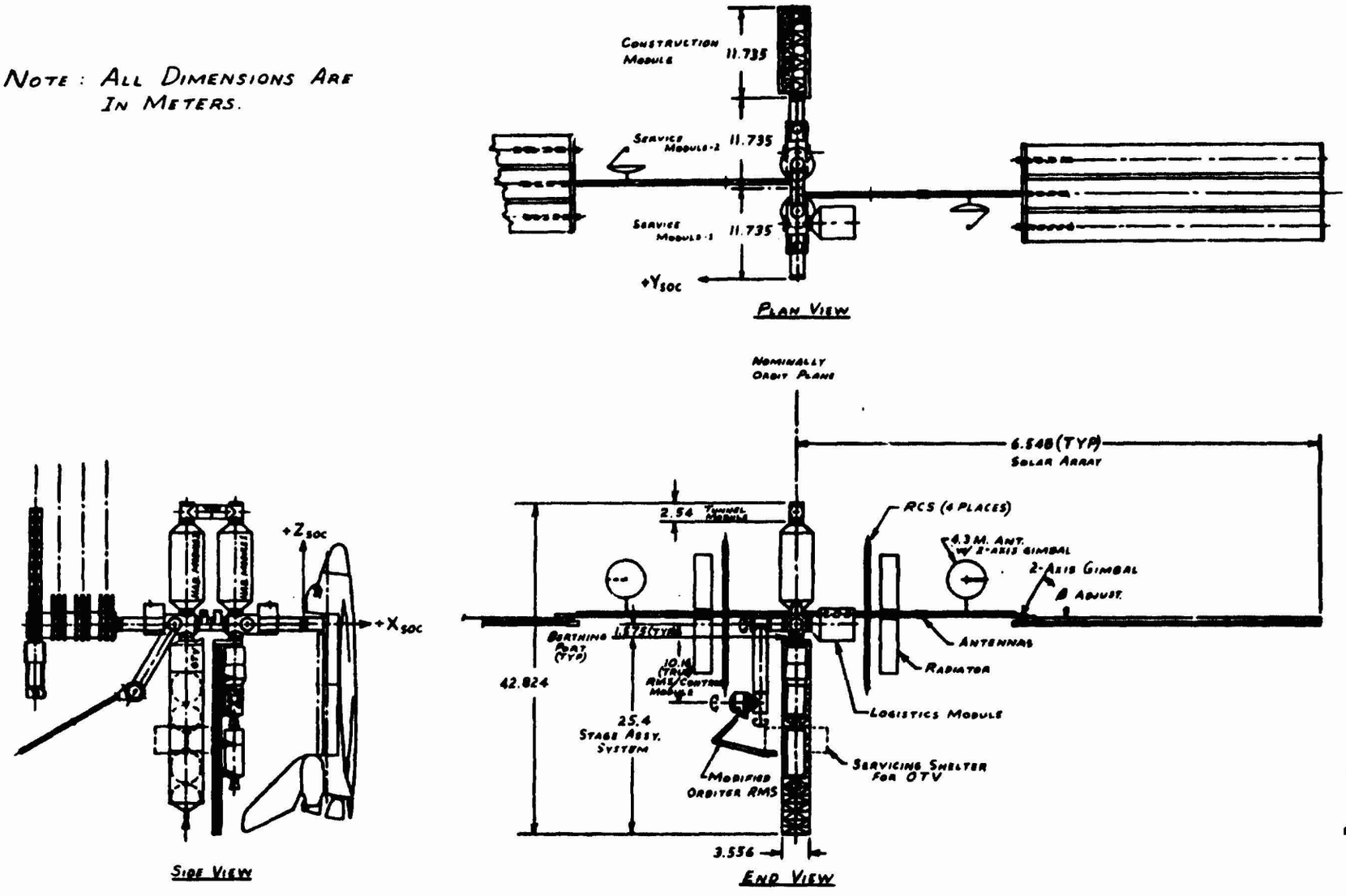


Figure 1.- Space Operations Center reference configuration.

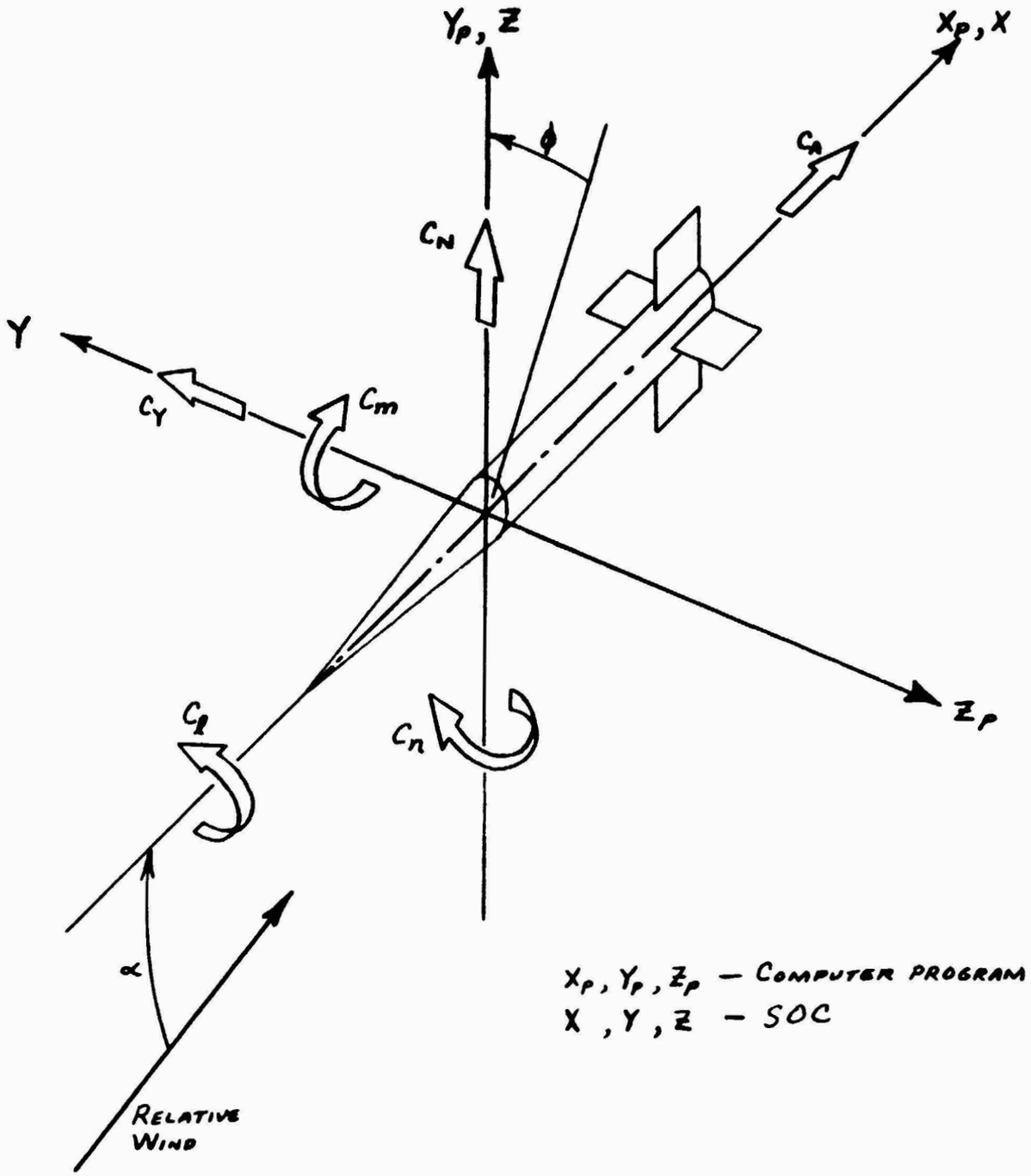
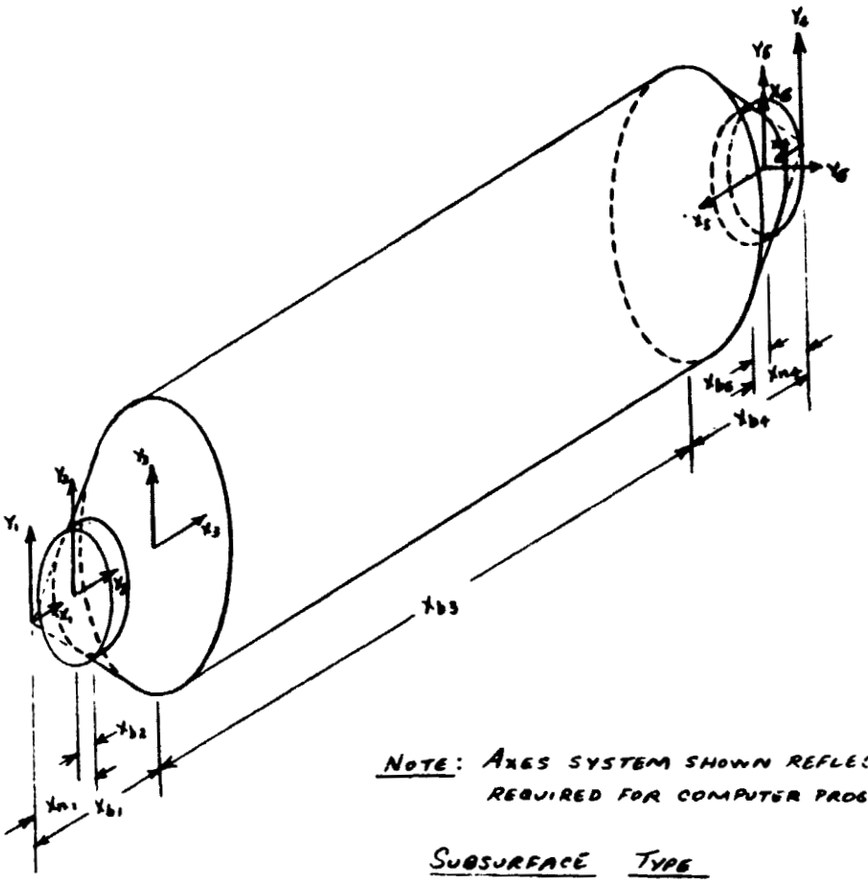


Figure 2.- Aerodynamic body axis system for computer program and for SOC.



NOTE: AXES SYSTEM SHOWN REFLECTS THAT REQUIRED FOR COMPUTER PROGRAM INPUT.

SUBSURFACE	TYPE
1	CONE FRUSTUM
2	CYLINDER
3	CYLINDER
4	CONE FRUSTUM
5	CYLINDER
6	CIRCULAR PLATE

Figure 3.- Subsurface axis system definition.

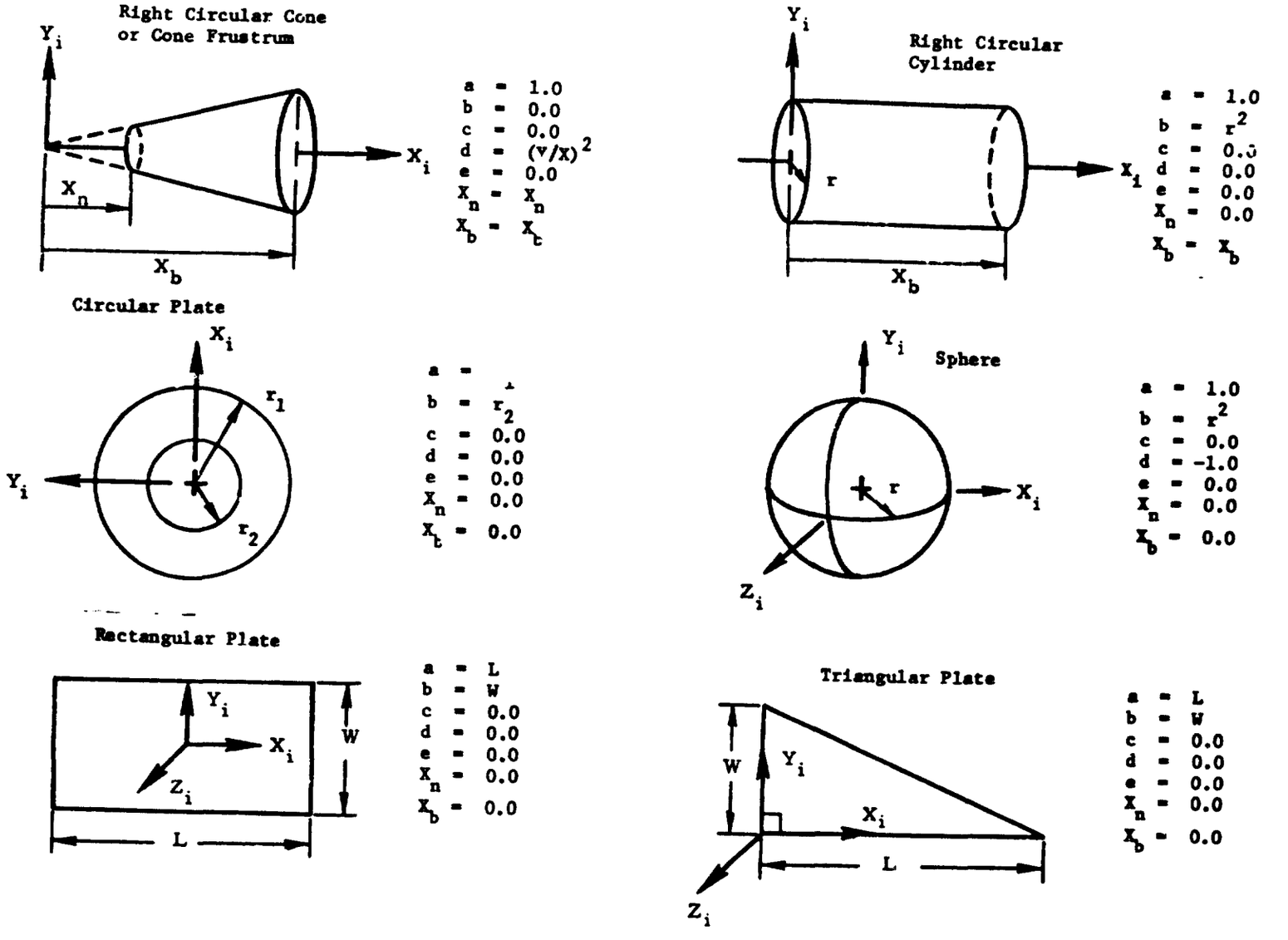
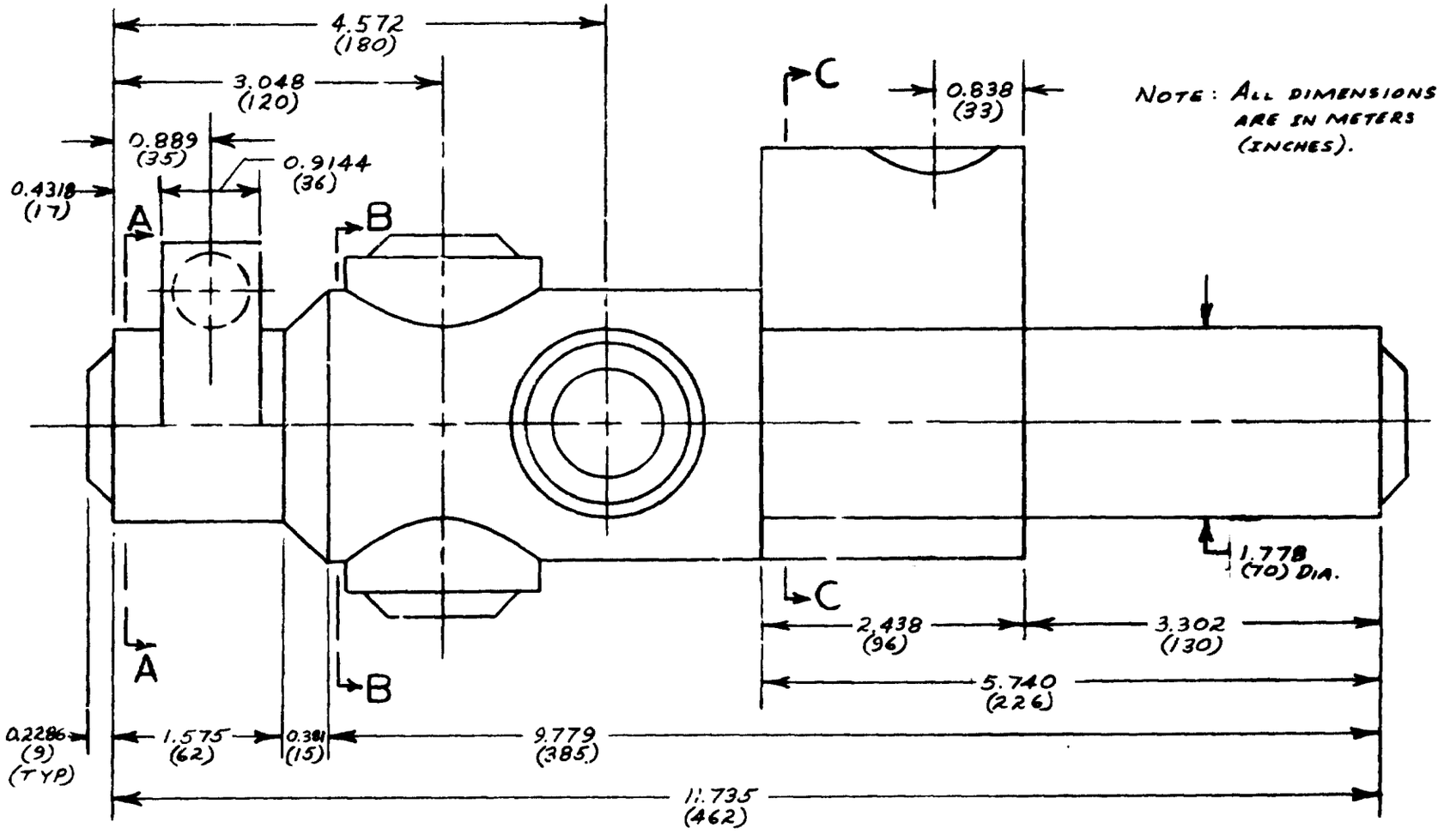
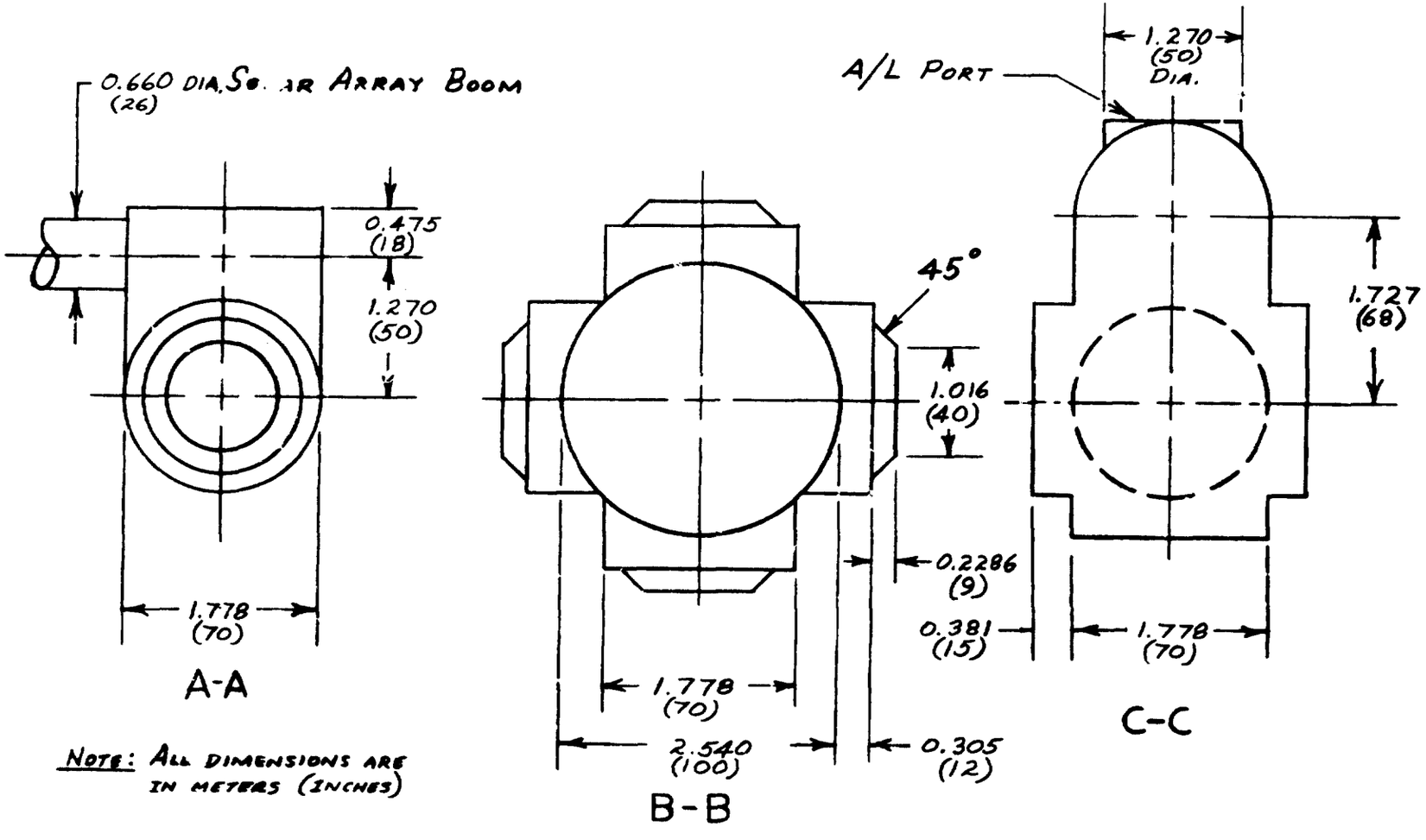


Figure 4.- Subsurface input requirements.



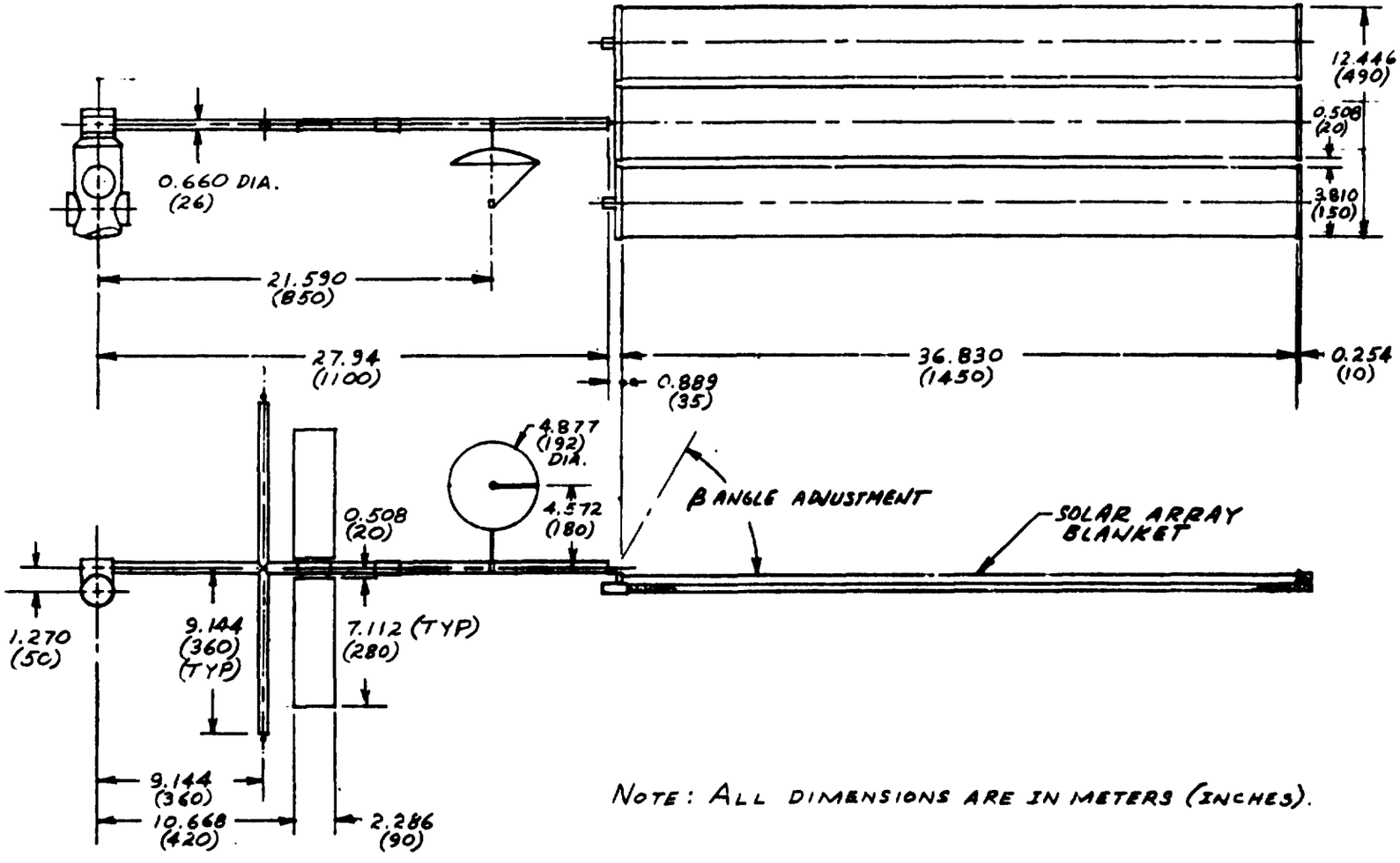
(a) Side view.

Figure 5.- Service module 1 and 2 geometry.



(b) Section views.

Figure 5.- Continued.



(c) Boom and solar panel geometry.

Figure 5.- Concluded.

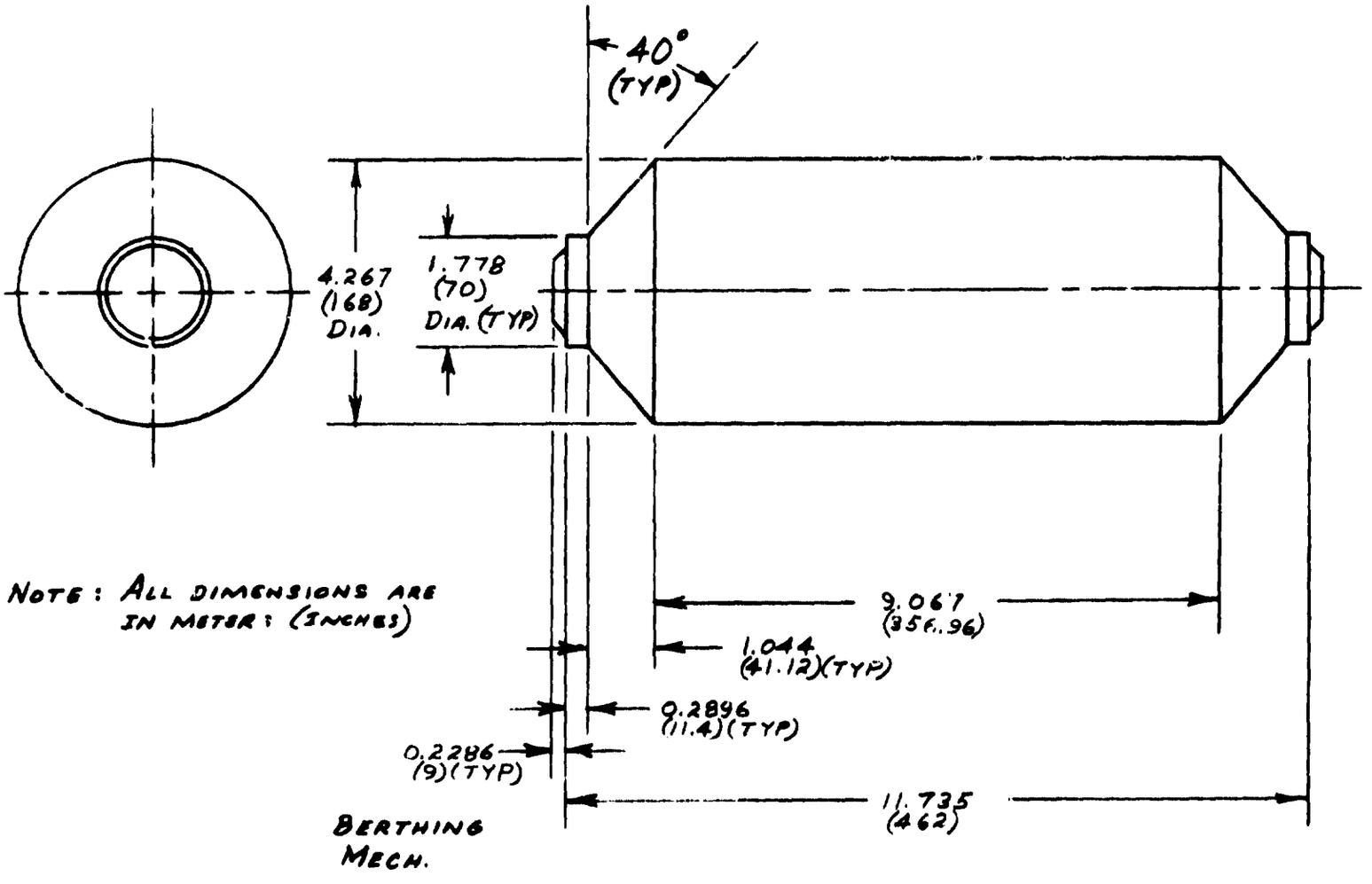


Figure 6.- Habitation module 1 and 2 geometry.

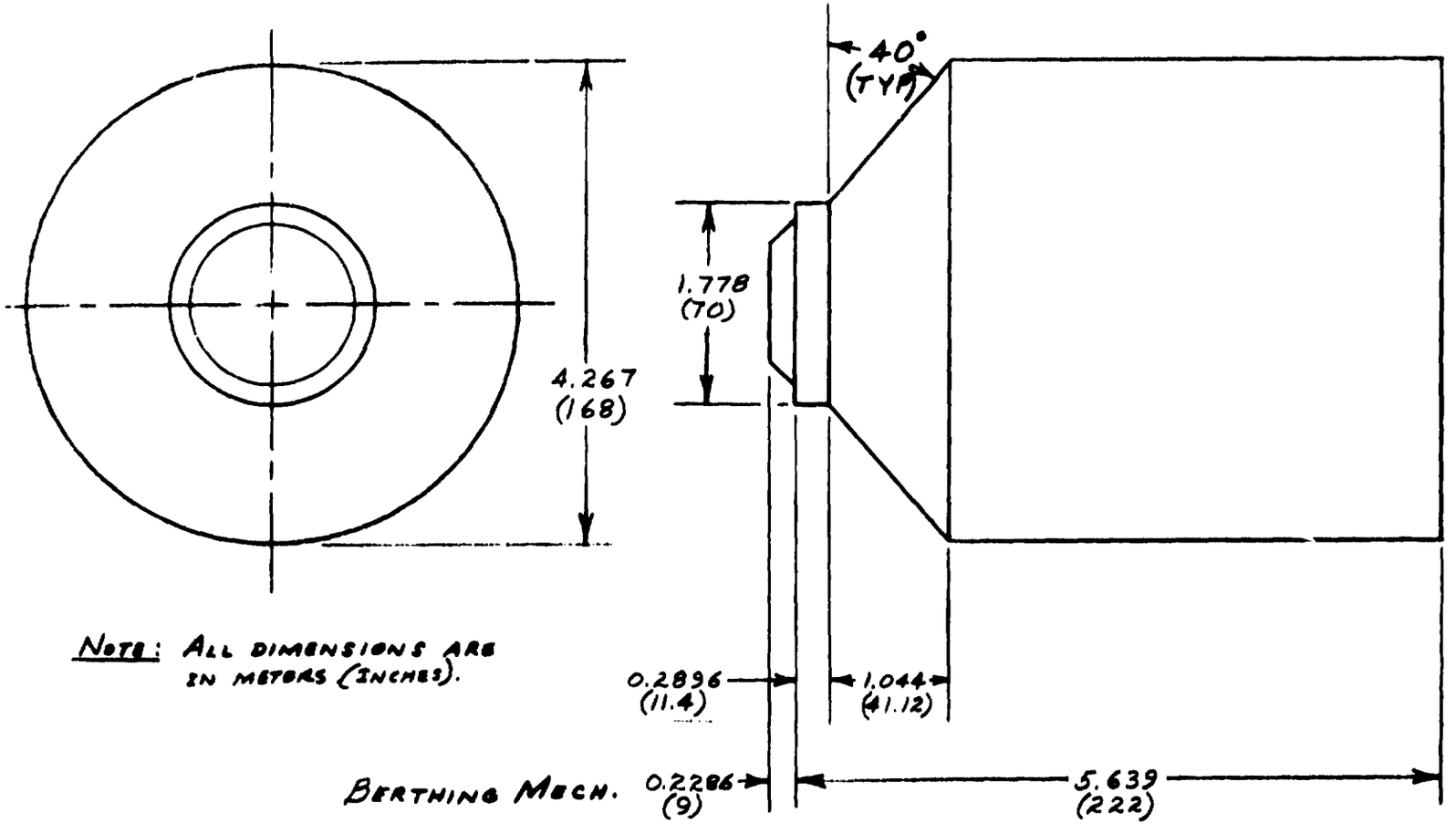


Figure 7.- Logistics module geometry.

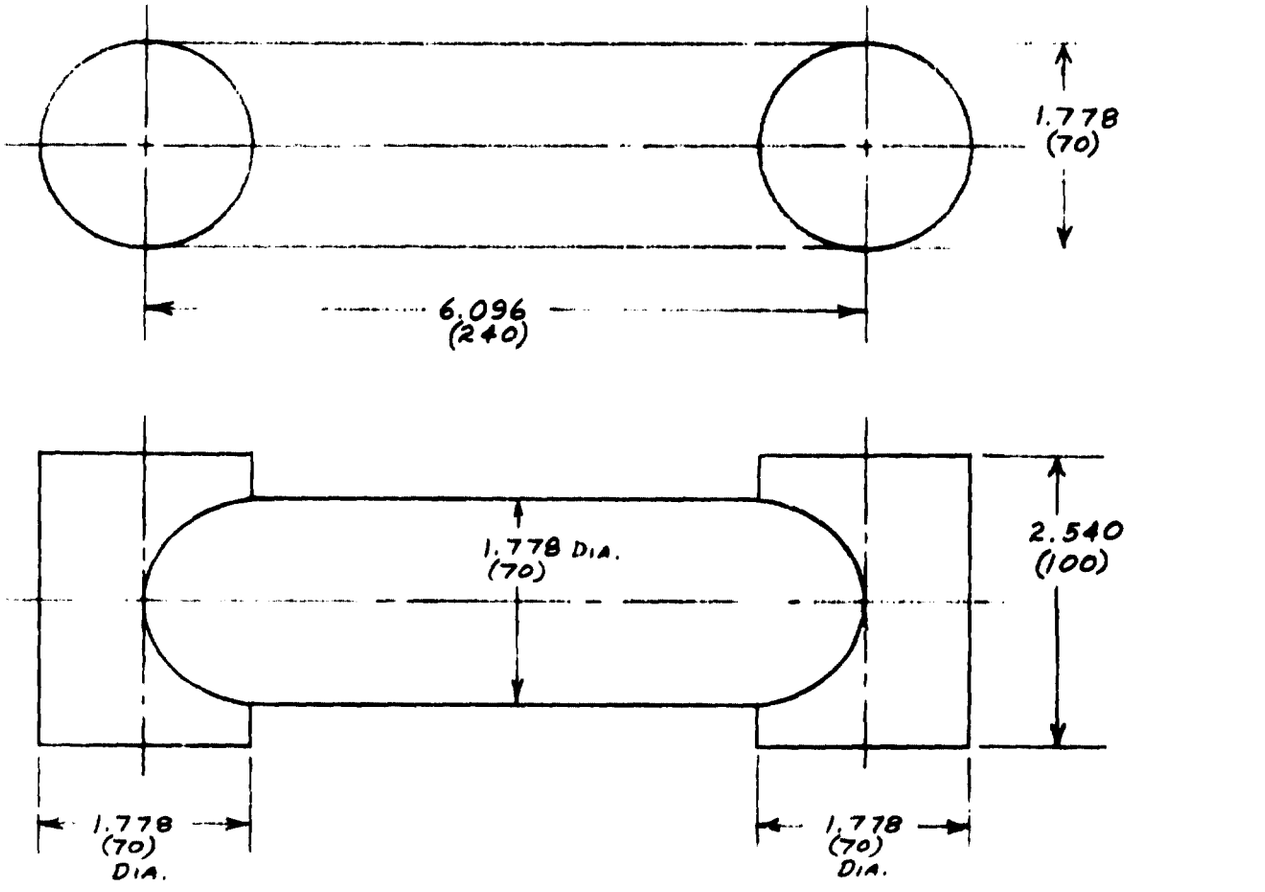
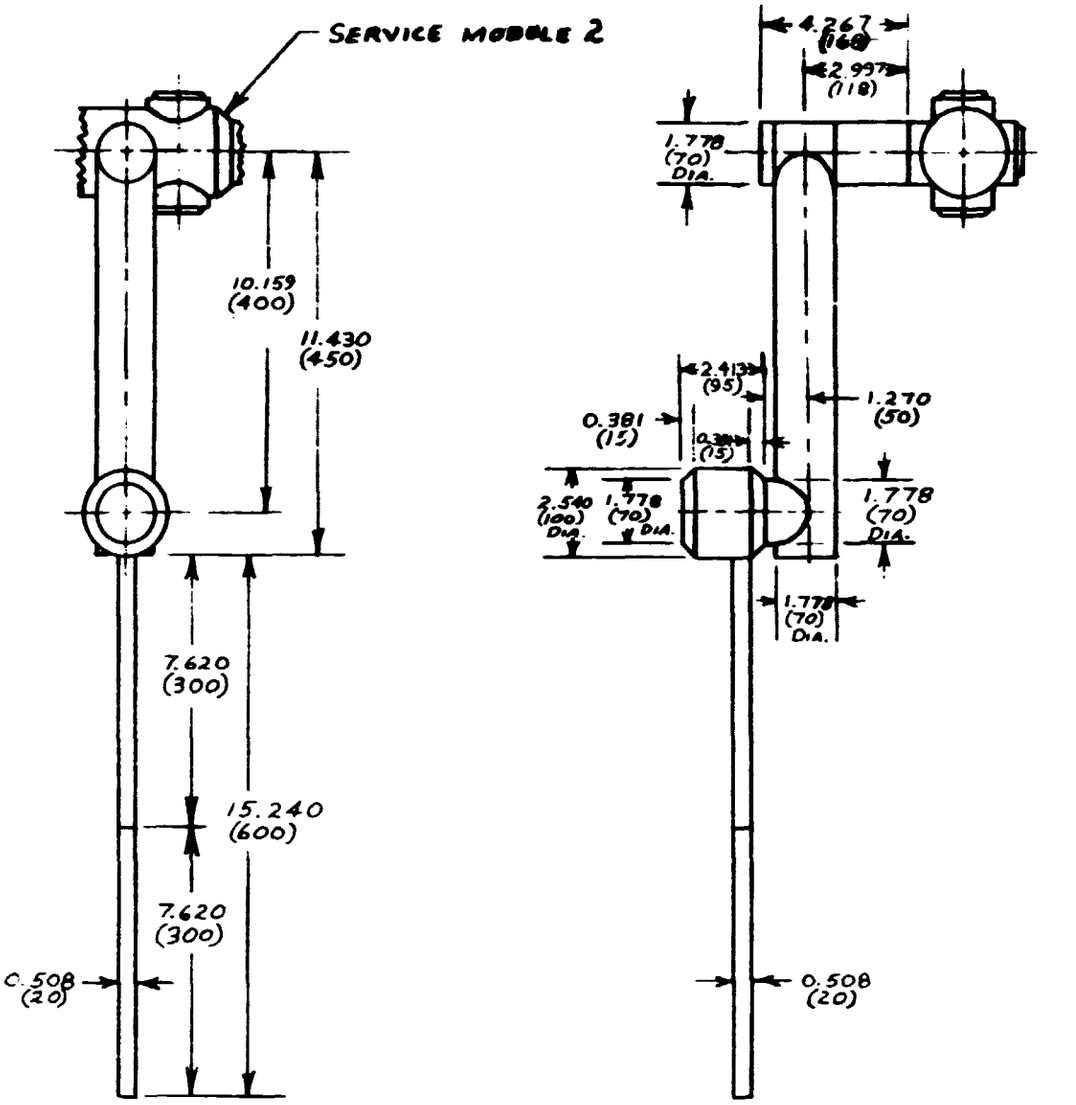


Figure 8.- Transfer tunnel geometry.



NOTE: ALL DIMENSIONS ARE IN METERS (INCHES)

Figure 9.- RMS/control module geometry.

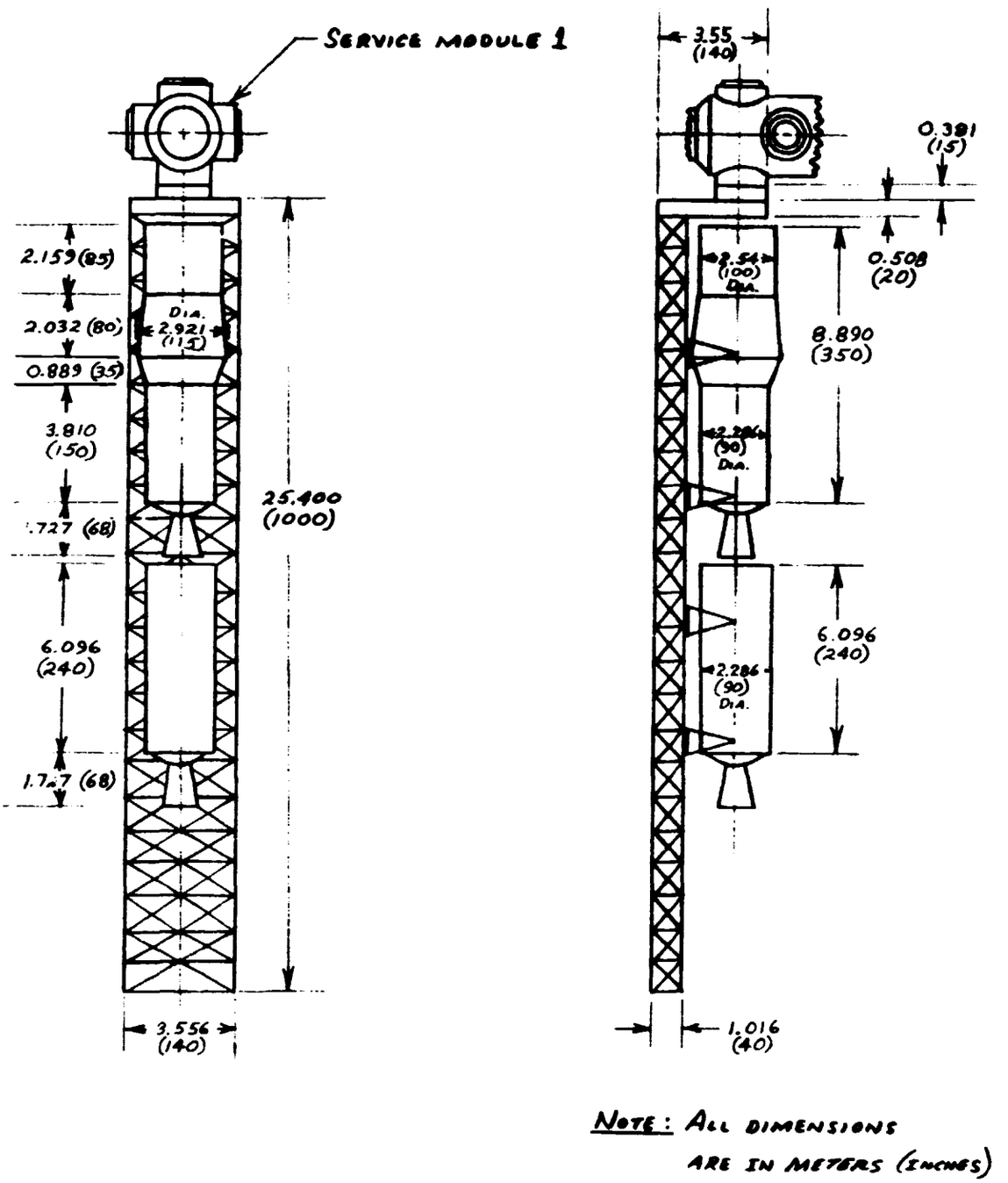


Figure 10.- Stage assembly system geometry.

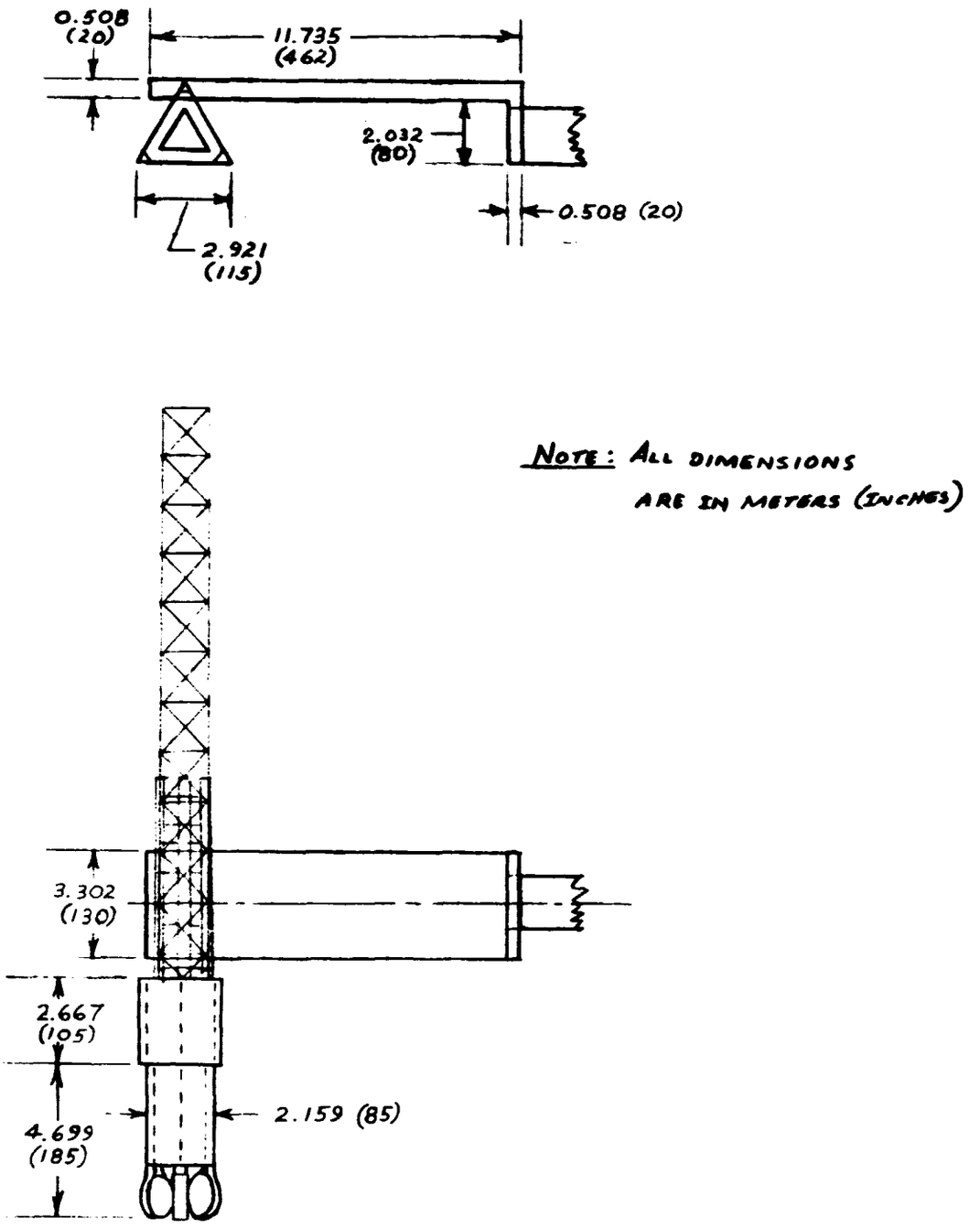
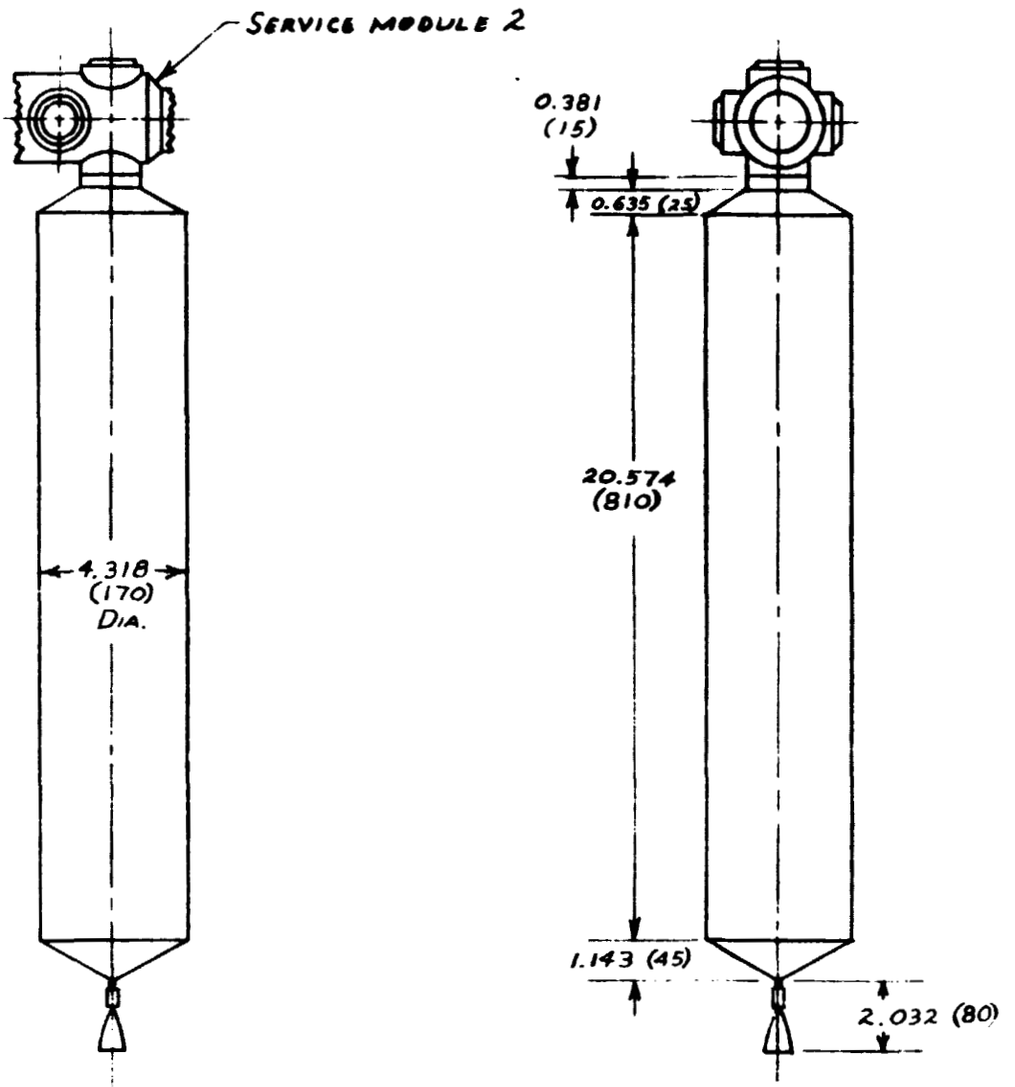


Figure 11.- Construction module geometry.



NOTE: ALL DIMENSIONS ARE IN METERS (INCHES)

Figure 12.- Orbital transfer vehicle (OTV) geometry.

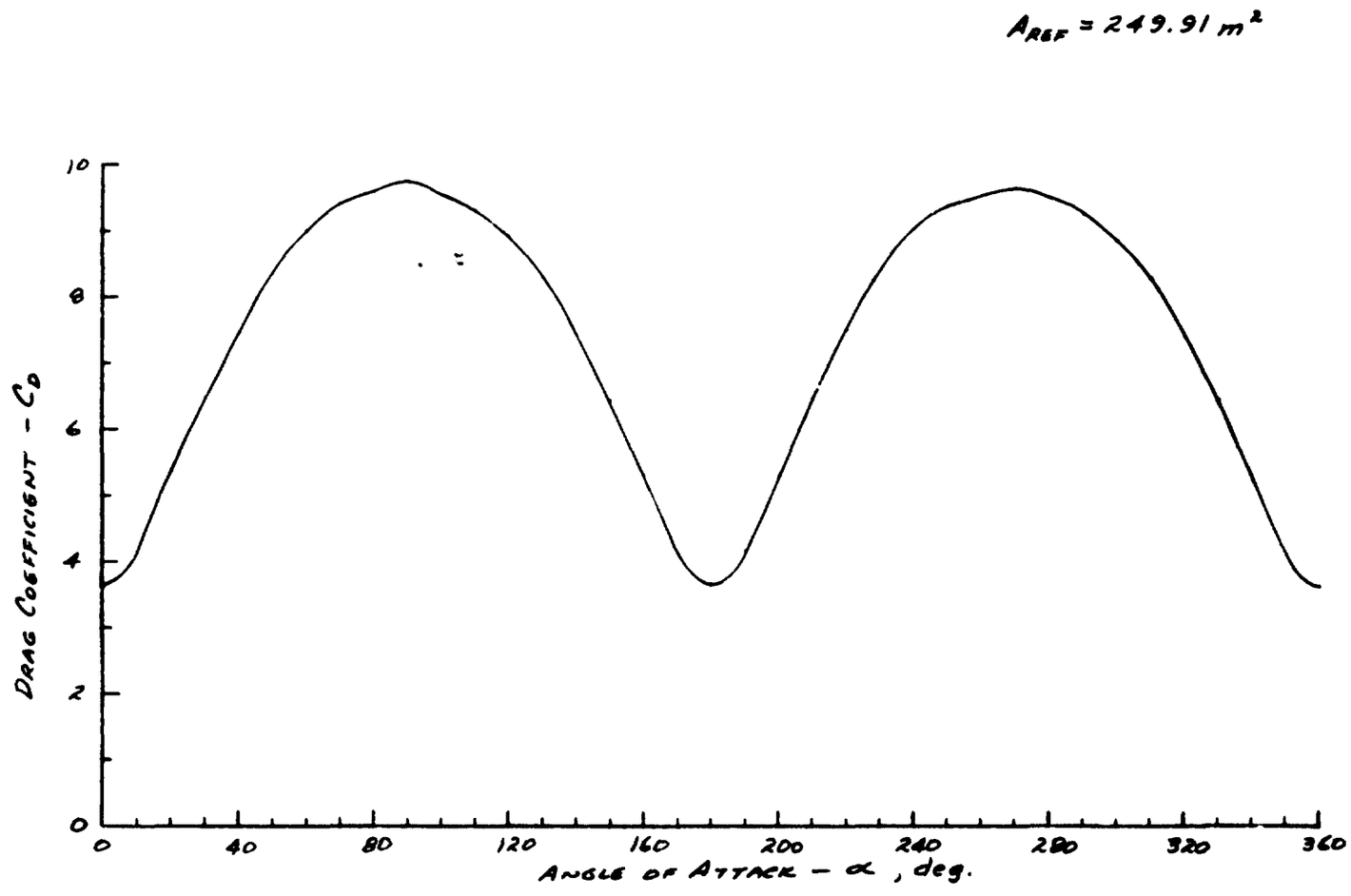


Figure 13.- Free molecular flow drag coefficient against angle of attack for the Space Operations Center configuration (build-up stage eight). Roll angle = 0°.